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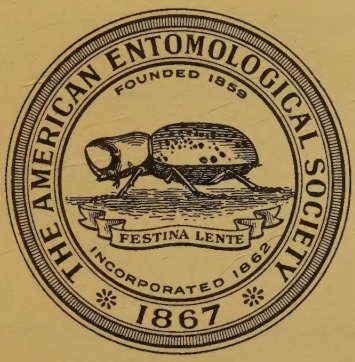

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TRANSACTIONS

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AMERICAN ENTOMOLOGICAL SOCIETY

VOLUME LXI

A REVISION OF THE GENUS MEGACHILE IN THE NEARCTIC REGION [1]

PART II [2]

MORPHOLOGY OF THE MALE STERNITES AND GENITAL ARMATURE AND THE TAXONOMY OF THE SUBGENERA LITOMEGACHILE, NEOMEGACHILE AND CRESSONIELLA

(Hymenoptera: Megachilidae)

BY THEODORE B. MITCHELL

North Carolina State College of Agriculture and Engineering

(Plate I)

This revision is based on material received from many sources whose generous loans have enabled me to examine extensive series from many localities throughout the United States and Canada. Extensive collections representing many localities were received from The Academy of Natural Sciences of Philadelphia, the American Museum of Natural History of New York, the Museum of Comparative Zoology of Harvard University and the United States National Museum; as well as the smaller personal collections of Dr. W. M. Mann, Dr. George Salt, Dr. E. S. G. Titus and Dr. W. M. Wheeler. Other collections studied

[1] Contribution from the Department of Zoology and Entomology, North Carolina State College, published with the approval of the Director of the North Carolina Experiment Station as paper No. 77 of the Journal Series.

[2] Part I. Classification and descriptions of new species. *Trans. Am. Ent. Soc.*, LIX, pp. 295-361, (1934).

were more nearly representative of restricted localities, as shown by the following list: From California, the California Academy of Science and Prof. P. H. Timberlake; from Canada, the Canadian Department of Agriculture and McGill University; from Colorado, the University of Colorado and the Colorado State Entomologist, as well as personal collections from Prof. T. D. A. Cockerell, Mr. C. P. Custer and Mr. Charles H. Hicks; from Florida, Dr. S. Graenicher at Miami; from Illinois, the Illinois Natural History Survey; from Kansas, the University of Kansas; from Minnesota, Dr. C. E. Mickel at the University of Minnesota; from Nebraska, the University of Nebraska; from New England, the Boston Society of Natural History; from North Dakota, the North Dakota Agricultural College; from Oregon, Prof. H. A. Scullen at the State Agricultural College; from South Dakota, the South Dakota State College; from Texas, Mr. H. B. Parks at San Antonio; from Utah, Prof. C. Lynn Hayward at Brigham Young University; and from West Virginia, Dr. L. H. Taylor at the University of West Virginia. Materials were collected by the writer in North and South Carolina, Georgia and the New England States.

Locality, date and flower records have been kept of course for all of the material studied, but details involving the number of specimens, sex, name of collector and source of specimens have not been included in the summaries of records in the following pages. Detailed records included have been derived chiefly from the collection of over 800 specimens of The Academy of Natural Sciences of Philadelphia and The American Entomological Society, and from my personal collection of over 2000 specimens of Nearctic species. Reference to sources of these materials recorded in detail will not be made, at least from the more widely spread and commonly occurring species, since these two collections are the chief ones involved. Moreover, much of the personal collection has been obtained through the retention of materials from collections loaned for study, and the original sources of much of that material cannot be given now.

Two of the groups included in this part of the revision, *Neomegachile* and *Cressoniella,* are neotropical in distribution, barely reaching the Nearctic region in each case, and the logic of including them in this revision of nearctic species might be questioned. Since there is no sharp line of division separating

the two regions, the Mexican border of the United States has been arbitrarily selected as the geographical limit covered in this revision, and all species occurring north of this limit are included, regardless of whether they are typical of one or the other of the two regions.

Morphology of the Male Sternites and Genital Armature

In Part I of this revision a revised classification of the Genus *Megachile* is proposed, retaining the original generic concept and recognizing sixteen subgeneric groups in the Nearctic region. A key to these subgenera is included but the groups are not characterized, although the species included in each are listed and new species are described. It is the purpose of this and following parts of the Revision to characterize these subgeneric groups, to key out the species included in each, and to describe more fully those species which are as yet inadequately described in the literature.

Structural characters, as contrasted with color, are to be emphasized in all of the descriptive work in this Revision, since such characters are apparently of more taxonomic value. They have been slighted in the past, to some degree at least, as certain of the male structures for example have never been mentioned in the descriptions of any of the Nearctic species. Chief among such characters are the retracted and consequently hidden abdominal sterna and genital armature of the male. The primary reason for the omission of such structures is the fact that they are hidden from view and must be dissected out of the specimen before they can be studied. As key characters therefore they are to be avoided; but a survey of the specific characteristics within the genus is incomplete if such structures are omitted. Moreover, they are not only of specific value, supporting and supplementing the more evident external structural and color differences between species, but are of even more value in the study of relationships and the determination of group limits. They are very complex in many of the species and are consequently difficult to describe adequately without accompanying illustrations. They have been figured in certain of the Palaearctic species [3] but have not been fully described even there.

[3] Saunders, *Trans. Ent. Soc. London,* p. 196, (1884).

An objection can be made to the dissection of specimens, in that they may be damaged thereby, and such treatment of unique or type specimens therefore would be undesirable. It has been found possible in this group of bees, however, to remove completely these hidden plates and the genital armature without injury to the specimen, and a method of mounting them on the same pin with the specimen has been employed which prevents their loss or confusion with those from other specimens.

In dissection the insect was first thoroughly relaxed by a twenty-four hour period in a moist chamber. Then the genital aperture, which is ventral in position, was pulled open, exposing in part the more basal of the hidden sterna. A sharp-edged dissecting needle was then used to separate these plates from the corresponding terga, and they were then removed. After their removal it was usually possible to remove the armature with its surrounding plates in toto. The genital aperture could then be again closed in its normal condition, leaving practically no evidence of the removal of the hidden structures. The plates and armature were then cleaned, either mechanically by teasing away the attached muscle tissues and membranes in alcohol, or by treatment with hot caustic potash for a brief period. Figures were made before they were mounted permanently, either while they were immersed in alcohol or temporarily mounted in glycerin.

In making the permanent mounts rectangles of heavy card or Bristol board, 10 by 20 mm. were used. In one end of these a circular hole 6 mm. in diameter was punched. A circular glass slip 7 mm. in diameter was cemented around its circumference to the edge of this hole, and after this had dried the resulting shallow cavity was filled with balsam, the dissected parts mounted in it, and a second glass slip used as a cover. This mount was then placed on the pin beneath the specimen and stored in a horizontal position until the balsam had hardened sufficiently to prevent the parts shifting position. Before mounting in balsam it is of course necessary to immerse the parts in xylol or some other oil.

While a specimen is relaxed it is well to open the mandibles so as to expose the dentition to full view, pull the tongue into an extended position if possible, and to so adjust the position of the

antennae, legs and wings as to render all important structures clearly visible. It is a great convenience, in fact, to have the specimen relaxed while it is being described, since it is then possible to move parts for their better examination, and danger of breakage becomes reduced to a minimum.

The structures composing the genital armature appear to be homologous with the genital structures which have been described in various other bee-genera, and therefore the terminology employed in the descriptions of these allied groups [4] will be followed here. It is necessary to give the telescoped sternites some preliminary consideration however before proceeding to discuss the modifications to which they are subject, since they have not been described previously.

In the male abdomen of *Megachile* there are six fully exposed terga and four exposed sterna. In addition, the apical rim of the seventh tergum is usually visible, and the genital aperture lies between this seventh tergum and the fourth sternum. The fifth sternum, usually considerably and often remarkably modified, lies immediately above the exposed fourth sternum, and the sixth, very much modified, lies just above the fifth. The seventh sternum has practically disappeared, being represented by a pair of minute sclerotized pieces attached to either side of the seventh tergum and lying just above the sixth sternum. The eighth sternum, however, is still in evidence as a more or less elongate tongue-like plate having a triangular base and a rounded or

[4] Dufour, *Mem. Ac. Sc. Sav. Etrang.*, (2), VII, p. 404, (1841). Thomson, *Hymen. Scandin.*, (1872). Hagens, *Berliner ent. Zeitschr.*, XVIII, p. 25, (1874). Hagens, *Deutsche ent. Zeitschr.*, p. 209, (1882). Schmiedeknecht, *Apidae Europaeae*, (1882-1884). Saunders, *Trans. Ent. Soc. London*, pp. 109 & 288, (1882). Saunders, *Trans. Ent, Soc. London*, p. 159, (1884). Saunders, *British Hymen. Acul.*, (1896). Radoszkowski, *Bull. Soc. Imp. Nat. Moscou*, LIX, p. 51, (1884). Radoszkowski, *Horae Soc. Ent. Ross.*, XXV, pp. 236 & 249, (1891). Radoszkowski, *Bull. Soc. Imp. Nat. Moscou*, (n. s.), VII, p. 163, (1893). Zander, *Zeitschr. wiss. Zool.*, LXVII, p. 461, (1900). Morice, *Trans. Ent. Soc. London*, p. 229, (1899). Morice, *Trans. Ent. Soc. London*, p. 161, (1901). Morice, *Trans. Ent. Soc. London*, p. 25, (1904). Strohl, *Zool. Jahrb. Abt. Syst.*, XXVI, p. 333, (1908). Franklin, *Trans. Am. Ent. Soc.*, XXXVIII, p. 223, (1912). Boulange, *Ann. Soc. Sc. Bruxelles*, XL, p. 89, (1920). Boulange, *Mem. Trav. Facult. Cathol. Lille*, fasc. 28, Chap. 7, p. 237, (1924).

truncate apical margin. It is attached to an entirely membranous eighth tergum, and this segment functions as a sheath for the genital armature.

Each of the unmodified exposed sterna is divisible into two areas, a cephalic or basal portion which is normally covered by the preceding sternum, and an exposed apical portion. These two areas differ also in that the cephalic portion is bare and impunctate, while the exposed portion of the plate is usually punctate and pubescent to some extent at least. A third more apical portion may also be distinguished, the free apical rim of the plate. The inter-segmental membrane extends cephalad from the line of division between this apical rim and median portion of the sternum to the basal margin of the following sternum.

In the fifth and least modified of the hidden sterna these three areas are definitely represented, becoming in fact more distinct, often quite definitely separated by intervening membranous areas. Since they are the structures to be considered in describing these modified plates they have been assigned names, adopting the terminology of McGillivray.[5] Thus the basal (cephalic) portion is called the *presternite,* the median portion the *medasternite,* and the free apical rim the *poststernite.*

The extreme lateral portions of the fifth sternum are entirely occupied by the lateral portions of the presternite. This is likewise true of the unmodified exposed sterna where these lateral portions are overlapped by the edges of the terga. In the fifth sternum they become more extensive. The presternite is broadly and deeply incurved, both basally and apically, between these lateral portions, resulting in an extreme shortening of the part medially. Thus the presternite often consists of two extensive lateral pieces united by a linear median portion. In certain groups (*Xeromegachile, Phaenosarus, Megachiloides*) the presternite is modified by the appearance of more or less distinct apical sclerites at each side of the medasternite, which are apparently derivatives of the presternite.

The medasternite occupies the apical incurved area of the presternite, and its basal margin usually coincides to some extent with the median apical margin of the presternite. The apical

[5] *External Insect Anatomy,* p. 221, (1923).

margin of the medasternite is more nearly straight. The surface is characterized by the presence of some form of pubescence, either as simple hairs or as more or less modified and often robust setae.

The poststernite is relatively less distinct, consisting usually of a narrow strip extending across the apical margin of the medasternite between the lateral portions of the presternite. In several of the species it is very indefinite, but is quite distinct in others, and may be considerably modified in certain specialized forms.

The sixth sternum is more highly modified than the fifth, and the lines of division into pre-, meda- and poststernites not as clear. It is usually both narrower and shorter than the fifth. The lateral portions of the presternite are clearly evident, but there are no distinct lines of division between them and the median setose portions of the plate which probably represent the medasternite. The basal margin of the plate is incurved on each side of the middle, resulting in two constrictions dividing it into a median and two lateral more or less equal areas. In several of the species (*brevis, relativa* and some others) the median portion is rather uniformly covered with setae, and it seems possible therefore that the entire median portion represents the medasternite, the median portion of the presternite being much reduced or absent. This is indicated at least, if the presence and distribution of setae can be taken as a safe criterion of the location and extent of the medasternite. In nearly all forms there is a tendency to a division of the setose area into two parts by a median non-setose line, while in many species there is evident a further tendency in specialization toward a concentration or localization of these setae into two narrowly limited areas, one on each side of the middle. In describing these parts these are referred to as the *medasternal areas,* since positive evidence regarding the limits of the medasternite is lacking. The poststernite is usually more conspicuous than in the fifth sternum. In the sixth it is modified into a relatively narrow lobe-like or tongue-like median apical protuberance, very often with prominent acute latero-apical angles. In the descriptions it will be referred to as the *poststernal lobe.*

It is only by careful dissection, and by carefully noting the relation of the sterna to the terga, that any evidence of the presence of a seventh sternum can be found. It is largely membranous, but in several of the species at least there are minute sclerotized lateral pieces in addition which may represent the extreme lateral portions of the plate. These are located just above the sixth and below the lateral angles of the eighth sternum.

The eighth sternum is a relatively simple plate, with no evidence of divisions into pre-, meda- and poststernites. The larger portion of it may possibly be homologous with the poststernal lobe of the sixth sternum and in turn with the poststernal strip of the fifth.

The genital armature is composed fundamentally of three parts, (1) the *cardo* or basal ring, (2) the *claspers,* and (3) the *aedagus* or penis. The cardo is basal in position, the claspers lateral and the aedagus median.

The cardo is short, transverse, relatively extensive dorsally, but very short (linear) ventrally. Franklin has suggested[6] that it represents the ninth tergum in *Bombus.* If such is the case, the ninth sternum has been obliterated, the tergum forming a complete ring.

The claspers consist of a pair of robust *stipites* and a relatively small and inconspicuous pair of *volsellae.* The stipites are broadly dilated basally, meeting at the mid-dorsal line at base, and are closely approximated to the caudal margin of the cardo dorsally. Apically they are divergent, to accomodate the aedagus, and are usually more or less sinuate, often variously lobed. dilated or otherwise modified. The volsellae are situated ventrad to the basal portion of the stipites, and are relatively short and inconspicuous. They are usually visible from the dorsal aspect between the basal portions of the stipites and aedagus. They are closely associated with the stipites but may be separated from them in dissection.

The aedagus is composed of a pair of sclerotized valves, the *sagittae,* which are connected by dorsal and ventral membranes for almost their entire length. There is a sclerotized band extending from one sagitta to the other near the base dorsally.

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[6] *Trans. Am. Ent. Soc.,* XXXVIII, p. 223, (1912).

The sagittae are quite robust, but usually slightly less so than the stipites, although they frequently exceed the stipites in length. They are much less subject to modification than the stipites and are therefore of relatively less taxonomic value. Their tips are usually approximated and may be slightly dilated or compressed. Basally the sagittae are continued beneath the basal portions of the stipites as relatively slender rod-like structures known as the *sagittal rods,* which usually terminate just before the apical margin of the cardo.

Taxonomy

Subgenus **LITOMEGACHILE** Mitchell

Litomegachile Mitchell, Trans. Am. Ent. Soc., LIX, p. 301, 1934.

Tongue: Second joint of labial palpus subequal to or very slightly longer than the first joint; maxillary palpi only very minutely pubescent, the third joint usually longer and more slender than the others.

Female.—Mandibles 4-dentate, or slightly angulate between the third and fourth teeth, a cutting edge between the third and fourth, with usually an incomplete one between the second and third; basal joint of flagellum subequal to the second joint and to the pedicel, sometimes slightly longer than either; mid metatarsi distinctly shorter and usually slightly narrower than their tibiae, the hind metatarsi considerably shorter and narrower than their tibiae; claws with acute basal teeth; abdomen cordate, the sixth tergum either straight or slightly concave in profile, the sixth sternum uniformly covered with scopal hairs, with no evident bare apical lip.

Male.—Mandibles 3-dentate, with a basal inferior projection; basal joint of flagellum subequal to pedicel, the second joint considerably longer; cheeks simple and unmodified below; front coxae pubescent anteriorly, with well developed spines but without red bristles; front tarsi slender and simple; mid tibiae with the usual apical spur; claws without basal teeth; sixth tergum with a low transverse carina which is usually emarginate medially, the apical margin of the segment with both median and lateral teeth; seventh tergum inconspicuous but visible.

Male sternites: Fourth sternum exposed; presternite of fifth sternum broad laterally, much narrowed medially where it is linear in some forms, the medasternite distinct, usually separated from the presternite by a distinct membraneous area, setose, the setae dilated apically, poststernal strip distinct; lateral portions of presternite of sixth sternum usually longer than broad, the median portion much reduced, the medasternal areas often represented by mere transverse lines of setae, the setae robust, often flexed, the poststernal lobe short and broad, with distinct latero-apical angles; eighth sternum truncate and slightly narrowed, but not angulate apically.

Genital armature: Stipites flattened, the tips acute, dorsally flexed, usually abruptly so; sagittae relatively straight, the tips slightly exceeding the stipites.

GENOTYPE: *Megachile brevis* Say. [Orthotype.]

The Subgenus *Litomegachile* is one of the more generalized groups of *Megachile,* having but few structural features indicative of specialization, visiting a very wide range of flowers and having consequently long flight periods, appearing rather early in the season and persisting as long as bloom is in evidence. The number of species is not great, but the few have quite fully occupied the Nearctic region, several of the species occurring throughout the United States and southern portions of Canada. Having such a broad geographical range and being so generalized in their food habits, they exhibit much variation, and certain of the species have been described several times under different names. Some of these names can be used to indicate rather definite local races, but others must be reduced to synonymy.

This subgenus is a close affinity of *Eutricharaea* of the Palaearctic region. In addition to the difference in range it may be separated from the latter by the absence of white apical fasciae beneath the scopa on the abdominal sterna of the females, and in the males by the presence of definite teeth on the apical margin (not the carina) of the sixth tergum.

Reference is made in the literature to the nesting habits of two or three species of *Litomegachile.* Reed [7] found the nest of a species identified by Say as *M. brevis* in the rolled leaves of a plum tree. There were four or five cells in each leaf, and the edges of the leaves appeared to be fastened with cement. Packard [8] also described the nests of this same species but failed to mention the site. Rau [9] reports taking the nest of *brevis* in a sumac stem, the cells being constructed of yellow petals, and also reports a nest of the same species found in a railroad tie. Hicks [10] found nests of *brevis* in burrows in the ground, the cells being constructed of red rose petals and rose leaves. Evidently this species is very variable as to the type of site that it employs in nest

[7] *Rep. Ent. Soc. Ontario,* p. 24, (1871). *Can. Ent.,* III, p. 210, (1871).

[8] *Psyche,* VI, p. 341, (1892).

[9] *Journ. Anim. Behav.,* VI, p. 369, (1916). *Trans. Ac. Sc. St. Louis,* XXIV, pp. 1 to 71, (1922).

building, or (as Hicks suggests) there is more than a single species involved. That some of these records may be erroneous with respect to the identification of the specimens seems quite possible, since the species of *Litomegachile* are so closely related, so variable, and consequently often difficult to positively identify.

Hicks [10] observed the nests of two other forms of *Litomegachile*. One of these, with cells of rose leaves in burrows in the ground, was identified as *cleomis*, which is shown further on to be a variety of *texana*. The other observation was of nests in old plant stems, the cells constructed of petals and leaves, and these were attributed to *perbrevis*. This name however is a synonym of *brevis*, but the species was probably distinct from *brevis*. Possibly his *perbrevis* is *gentilis*, as specimens of this species erroneously determined as *perbrevis* have been observed in collections.

One unpublished record of the nesting site chosen by *mendica* is available, as a specimen of this species collected by Dr. L. H. Taylor at Forest Hills, Massachusetts bears the following note: "Building in stone wall, Bussey Inst.". Two personal observations have been made on the nesting habits of this same species, in each case the nest being built in cavities in wood. In one of these the wood was well seasoned and dry, whereas the other was in a well rotted log, leaves being employed in the construction of the cells in both instances.

It would appear from these few scattered records that this group of species is quite as generalized in the nest-building habits as it is in the flower-visiting habits and in structural features.

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[10] *Univ. Colo. Stud.*, (15), III, pp. 227-232, (1926).

Key to Species of Litomegachile

Females

1. Mandibles angulate between third and fourth teeth; sixth tergum nearly or quite straight in profile, the pubescence usually appressed.9
   Mandibles not angulate between third and fourth teeth; sixth tergum usually quite distinctly concave in profile, with abundant erect hair visible.....2
2. Abdominal segments with deep carinate basal grooves, that on the fifth tergum definite and distinctly carinate 3
   Basal grooves more shallow, less sharply carinate, that on the fifth reduced to a mere impression or entirely lacking 6
3. Second, third and fourth terga with conspicuous black hairs visible laterally in dorsal aspect 4
   Second, third and fourth terga with only pale hairs visible laterally in dorsal aspect.....5
4. First segment of abdomen with considerable black pubescence *texana* Cresson
   First segment of abdomen entirely white pubescent *texana* var. *cleomis* Cockerell
5. Third and fourth terga with definite black pubescence on discs; sixth tergum just perceptibly concave in profile, the pubescence subappressed and entirely black.....*coquilletti* Cockerell
   Third and fourth terga pale pubescent; sixth tergum distinctly concave in profile, with conspicuous erect hairs and appressed pale tomentum.....*texana* var. *lippiae* Cockerell
6. Scopa of sixth sternum pale at least in part.....7
   Scopa of sixth sternum entirely black.....8
7. Vertex and mesonotum with conspicuous black pubescence...*brevis* Say
   Vertex and mesonotum entirely pale pubescent *brevis* var. *nupta* Cresson
8. Pubescence of second tergum black at least in part (eastern) *brevis* var. *pseudobrevis* n. var.
   Pubescence of second tergum entirely pale (western) *brevis* var. *onobrychidis* Cockerell
9. Sixth tergum slightly concave in profile; scopa more white, entirely black on sixth sternum.....*gentilis* Cresson
   Sixth tergum straight in profile; scopa yellow, with but little black on sixth sternum.....10
10. Pubescence of second and sixth terga black in large part *mendica* Cresson
    Pubescence of second tergum entirely white, the sixth with considerable pale appressed tomentum.....*mendica* var. *snowi* Mitchell

Males

1. Median teeth of apical margin (not carina) of sixth tergum nearer to each other than to the lateral teeth or these distances subequal.....7
   Median teeth of the sixth tergum definitely nearer the lateral teeth than to each other.....2
2. Joints two, three and four of the front tarsi definitely yellow, contrasting with the dark basal joint.....*coquilletti* Cockerell
   Front tarsal joints not contrasting in color.....3
3. Carina of sixth tergum definitely and quite deeply emarginate medially.....4
   Carina of sixth tergum with at most an indefinite median emargination which is often indistinguishable from the more lateral irregular crenulations.....5
4. Mesonotum, scutellum and abdominal terga with a considerable admixture of black pubescence.....*texana* Cresson
   Mesonotum, scutellum and at least the basal abdominal segment with but slight if any admixture of black pubescence
   texana var. *lippiae* and var. *cleomis*
5. Pubescence of abdomen black in part...*brevis* var. *pseudobrevis* n. var.
   Pubescence of abdomen entirely pale.....6
6. Sixth tergum with conspicuous white tomentum which largely hides the surface.....*brevis* Say
   Sixth tergum with only a very fine pale pruinosity which does not obscure the surface to any degree..*brevis* var. *onobrychidis* Cockerell
7. Fifth tergum with a conspicuous pale apical fascia
   mendica var. *snowi* Mitchell
   Fifth tergum not fasciate.....8
8. Punctures of fifth tergum numerous but well separated, the surface between them polished; eastern.....*mendica* Cresson
   Punctures of fifth tergum very close, almost crowded; western
   gentilis Cresson

Megachile (Litomegachile) brevis Say (Pl. I)

Megachile brevis Say, Boston Journ. Nat Hist., IV, p. 407, 1837. Leconte, Compl. Writ. T. Say, II, p. 783, 1859. Reed, Rep. Ent. Soc. Ontario, p. 24, 1871. Reed, Can. Ent., III, p. 210, 1871. Provancher, Nat. Can., XIII, p. 229, 1882. Provancher, Pet. Faune Ent. Can. Hym., p. 713, 1883. Packard, Psyche, VI, p. 341, 1892. Robertson, Trans. Ac. St. Louis, VII, (14), p. 352, 1897. Cockerell, Denison Univ. Bull., II, p. 65, 1898. Cockerell, Ann. Mag. Nat. Hist., (7), VI, p. 19, 1900. Robertson, Trans. Am. Ent. Soc., XXIX, p. 172, 1903. Cockerell, Univ. Colo. Stud., IV, (4), p. 254, 1907. Friese, Das Tierr., Lfg. XXVIII, Apidae 1, p. 235, 1911. Rau & Rau, Jorn. Anim. Behav., VI, p. 369, 1916. Rau, Trans. Ac. Sc. St. Louis, XXIV, pp. 1-71, 1922. Hicks, Univ. Colo. Stud., (15), III, p. 227, 1926. Graenicher, Ann. Ent. Soc. Am., XXIII, p. 163, 1930.

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Megachile perbrevis Cresson, Trans. Am. Ent. Soc., VII, p. 127, 1878. Friese, Das Tierr., Lfg., XXVIII, Apidae 1, p. 243, 1911. Cresson, Mem. Am. Ent. Soc., I, p. 127, 1916.

Megachile (*Megachile*) *brevis* Viereck, Conn. Nat. Hist. Surv. Bull., XXII, p. 746, 1916.

Female.—Size: Length 9 to 12 mm.; breadth of abdomen 3 to 3.7 mm.; anterior wing 6 to 7 mm.

Structure: Face slightly broader than long; eyes convergent below; clypeal margin straight and entire; mandibles distinctly 4-dentate, not angulate between third and fourth teeth; lateral ocelli very slightly nearer edge of vertex than to eyes; vertex flattened; cheeks subequal to eyes in width; second and third abdominal terga rather deeply grooved basally, the fourth somewhat less so, the apical margins depressed laterally, but only slightly so medially, sixth tergum concave laterally and slightly so in profile, with much erect pubescence visible in profile.

Puncturation: Very fine and close on cheeks, scutellum laterally, and on pleura above; deep and distinct on vertex, usually rather close medially; more coarse on clypeus, close laterally, more sparse medially; rather coarse but close on pleura below; quite fine and close but distinct on mesonotum anteriorly, becoming more widely separated and coarse medially and laterally, as also on scutellum medially; minute and indistinct on abdomen basally, becoming more coarse and distinct, yet quite fine and close toward segment five, very close on the sixth.

Color: Black; antennae reddish-piceous beneath; tegulae ferruginous or piceous; wings subhyaline, faintly clouded apically, the nervures piceous; spurs yellow.

Pubescence: Fuscous or blackish on vertex, mesonotum and in part at least on scutellum, otherwise whitish on head, thorax, legs and basal abdominal segments; black on third to fifth segments, the second whitish basally, but with dark hairs apically; segments one to five with rather thin entire white apical fasciae, extremely thin or interrupted on the more basal segments; sixth tergum with erect black hairs, and with at least a slight amount of pale appressed pubescence apically; scopa white, a few dark hairs on sixth sternum apically.

Male.—Size: Length 7 to 9 mm.; breadth of abdomen 2.5 to 3 mm.; anterior wing 5.5 to 6 mm.

Structure: Face very slightly broader than long; eyes slightly convergent below; clypeal margin very slightly incised medially, otherwise entire; inferior mandibular projection slender, subbasal, acute; lateral ocelli subequally distant from eyes and edge of vertex; vertex nearly flat; cheeks subequal to or slightly narrower than eyes; coxal spines short, subacute, largely hidden by pubescence; second to fifth abdominal segments quite deeply grooved basally, their apical margins slightly depressed laterally, medially also on the fourth and fifth; sixth tergum nearly vertical in position, the carina low, irregularly dentate, obscuring the small and indefinite median emargination, the median carinate teeth of the apical

margin slightly pointed, somewhat nearer the small acute lateral teeth than to each other; seventh tergum barely evident, transverse, not conspicuously protuberant medially.

Sternites: Fifth presternite linear medially, the medasternite uniformly minutely setose, the poststernal strip very slightly incurved medially; lateral portions of sixth presternite longer than broad, the medasternal areas extensive and with scattered robust setae, the more apical of these being in a quite definite row on each side, the poststernal lobe broad and short, with lateral angles not produced, the apical margin slightly outcurved medially.

Genital armature: Stipites constricted above base, flattened toward tip, apex acute and but slightly flexed; sagittae about equally as robust as the stipites, rather abruptly dilated just above the base of the stipites; volsellae obliquely truncate and slightly emarginate on the apex.

Puncturation: Very fine and close on cheeks, scutellum and pleura; slightly more coarse deep and distinct, though very close, over entire disc of mesonotum; about equally coarse but more definitely separated on vertex; rather close over entire abdomen, very fine basally, becoming rather coarse and deep apically, but very fine and close on the sixth tergum.

Color: Black; antennae reddish-piceous beneath; tegulae yellowish-ferruginous; wings hyaline, slightly smoky apically, the nervures ferruginous or piceous; front femur slightly reddened on anterior face, and the apical tarsal joints sometimes reddened, but legs otherwise black; spurs yellow.

Pubescence: Entirely whitish or ochraceous, with no dark admixture whatever; second to fifth abdominal terga with pale apical fasciae, these thin on the more basal segments; sixth tergum usually quite densely covered with pale tomentum above.

Range.—This is one of our most widely distributed species, occurring throughout the United States and the more southern portions of Canada. It is of wide occurrence seasonally also, appearing as early as March and April in the more southern parts of its range, and continuing in flight through the warmer months. Following is a partial list[11] of locality records:

California: 2♂, Auburn, July 25 & 27, 1915, (L. Bruner). 7♂, Los Angeles, March 24, 1933. 2♀, Los Angeles, June 22 and July 5, 1926; (all Hicks). 1♂, 4♀, Los Angeles County, (Coquillett). 1♂, 1♀, Riverside, Sept. 12, 1926 and April 25, 1927, (♀ from nest in ground; Timberlake). 3♂, 3♀, Sacramento, Sept. 27 and Oct. 6, 1916, (L. Bruner; on *Melilotus alba*). 1♀, Shasta County. Also identified from Altedena, Jacumba, Lake Tahoe and San Diego.

[11] See page 2.

COLORADO: 2♀, no locality record. 1♂, Boulder County, June 4 & 9, 1925. 1♂, 2♀, Boulder County, July 5 & 15, 1925. 1♂, 3♀, Boulder County, Aug. 10, 1925. 2♂, 4♀, Boulder County, Oct. 17 & 18, 1925; (all C. P. Custer). 1♂, Hubbard Ranch, Elbert, June 9, (Figgins; on *Gilia*). 44♂, 29♀, Boulder County, Apr. to Oct., 1925 & 1926, (Hicks). 1♀, Valmont, Aug. 14, 1925, (L. O. Jackson; on *Nutilla stricta*). 1♀, Boulder, July 3, 1924, (L. O. Jackson; on *Petalostemon compactus*). 3♀, Denver, July, 1897, (on alfalfa). 2♀, Wray, Aug. 17 to 19, 1919. Also identified from Aurora, Clear Creek, Colorado Springs, Grand Junction, La Junta, Los Pinos, Semper and Sterling.

CONNECTICUT: 3♂, 4♀, Hartford, July 30 to Oct. 7, 1893-1898, (on *Polygonum, Solidago* and *Trifolium repens*). 1♀, Wallingford, Sept. 11, 1922. Also identified from Colebrook and North Haven.

FLORIDA: 1♀, Biscayne Bay, Feb. 9, 1904, (Morgan Hebard). 1♀, De Funiak Springs, Oct. 17-19, 1914. 1♀, Miami, Nov. 22, 1927, (Graenicher). 2♀, Royal Palm Park, April, 12-18, 1923. Also identified from Lakeland and Pensacola.

GEORGIA: 2♀, no locality record. 1♂, 2♀, Tifton, June 21, 1896.

ILLINOIS: 1♂, 4♀, no locality record. Identified from Meredosia and Wellington.

INDIANA: 1♀, Lafayette, (with nest, found on corn; Webster, No. 1262, through C. V. Riley). Also identified from Clark County and Vincennes.

IOWA: 1♀, Ames, July 28, 1893, (E.D.B.). Also identified from Sioux City.

KANSAS: 2♀, Wellsville, July 1 & 5, 1901. Also identified from Baldwin, Blue Rapids, Clay County, Clyde, Dickinson County, Garden City, Marysville, Riley County, Walthena, and Whiting.

LOUISIANA: 1♂, Mound, May 13, 1905, (Hunter, No. 221; C. R. Jones, Coll.).

MASSACHUSETTS: 1♀, Fairhaven, Aug. 14, 1926. 1♂, 21♀, Forest Hills, July 9-26, 1926, July 1-29, 1927, (on *Rudbeckia hirta, Baptisia* and *Asclepias*). 4♂, 5♀, Needham, June 9-17, 1925, July 17, 1926, Aug. 7, 1926, (on *Baptisia, Geranium maculatum,* and yellow clover); (all Mitchell). 1♀, Dedham, Sept. 4. Also identified from Andover, Bridgewater, Dennis, Dover, Edgartown, Holliston, Nantucket, Sharon, Southbridge, Squantum, Wellesley, and Wellfleet.

MISSISSIPPI: 1♀, no locality record.

MISSOURI: 2♂, 1♀, Columbia, June 7, 1923, (Bromley).

MONTANA: 1♂, 5♀, no locality record.

NEBRASKA: 4♂, Lincoln, May. 2♂, Mitchell, Aug. 6 and 11, 1915, (E. M. Partridge). 2♀, Omaha, July 27, 1913 and Aug. 20, 1914, (L. T. Williams; on *Trifolium pratense* and *Solidago canadensis*). 1♀, Sioux County. 1♀, West Point, June, 1888(?), (L. Bruner). 1♀, West Point, Sept. 8, 1912, (J. C. Crawford). 1♂, Sidney, Cheyenne County, July 30, 1910, 41-4300 ft. Also identified from Cambridge, Collins, Dundy County, Nebraska City, Neligh, North Platte, Ogallala, Oxford, Red Cloud, South Bend, Tekomah, Union, Valentine, War Bonnet Canyon, Weeping Water, Wymore, and Wyoming.

New Jersey: 1♀, no locality record. 1♂, Cape May, June 25. 1♂, Clementon, May 30, 1897. 1♀, Ocean Grove, July, 1893. 1♀, Westville, May 28, 1899. Identified also from Ramsey.

New Mexico: 1♀, Alamogordo, May 1, 1902. 1♀, Las Vegas, (Cockerell; on *Engelmannia*). 1♀, Las Vegas, July 10, (Cockerell; on white hollyhock). 1♀, Las Vegas, July 24, 1899, (W. Porter; on *Sidalcea reticulata*). 1♂, Mesilla Park, Apr. 24, 1895, (Jessie Casad; on *Onobrychis*).

New York: 2♀, Geneva, Aug. 15, 1928, (Mitchell). Also identified from Jamaica, Stoney Island, West Nyack, and White Plains.

North Carolina: 5♂, Aberdeen, Apr. 15 and May 29, 1922, (on *Rubus* and *Fragaria*). 1♂, 2♀, Aberdeen, June 28, 1930. 1♀, Biltmore, July 19, 1921. 1♂, Bryson City, Oct. 22, 1922. 3♂, 2♀, Burgaw, July 18, 1928. 1♀, Carolina Beach, Sept. 12, 1931, (on *Strophostyles*). 1♂, Charlotte, Apr. 13, 1922, (on *Rubus*). 1♂, 1♀, Flat Rock, July 21, 1921 and July 20, 1922. 1♂, 1♀, Greensboro, Aug. 30 and 31, 1921. 2♂, 22♀, Harker's Island, June 12, 1931, (on *Cuscuta* and *Crotalaria*). 2♂, 6♀, Harnett County, June 5, 1931, (on *Tephrosia*). 1♂, Highlands, June 25, 1925. 2♀, Hoffman, July 4, 1928. 1♂, Kingsboro, June 9, 1932, (on *Trifolium*). 1♀, LaGrange, July 27, 1921. 7♀, Lakeview, Oct. 23, 1933, (on blue gerardia). 1♂, Lumberton, June 22, 1928, (on *Koellia*). 1♂, 2♀, Marion, July 8, 1921 and Aug. 24, 1928. 1♀, Marshall, July 8, 1928. 2♀, Mars Hill, July 6, 1928. 1♀, Merry Oaks, May 27, 1926, (on *Tephrosia*). 2♂, Moncure, Sept. 6, 1921. 22♂, 18♀, Raleigh, Apr. 24, to late Sept. 1♂, Sanford, June 6, 1922. 1♂, 1♀, Smokemont, July 20, 1923, (on *Rudbeckia hirta*). 1♀, Tarheel, July 22, 1928, (on *Galactia*). 7♂, 2♀, Willard, June 2, 1923 and June 22, 1929, (on *Polygala* and *Koellia*). 1♂, 7♀, Wilmington, June 23 and July 21, 1928, (on *Hypericum* and *Galactia*); (all Mitchell). 1♂, Laurel Hill, June 1, 1922, (C. S. Brimley). 8♂, Raleigh, May 18, 1921; May 31, 1922, June 21 & 28, 1921, July 8, 1921, Oct. 2, 1923, (C. S. Brimley). 1♂, Swannanoa, May 26, 1923, (C. S. Brimley; on *Senecio*).

Oregon: 1♀, no locality record. 1♀, Forest Grove, Aug. 1, 1918, (M. C. Lane). Also identified from Albany, Corvallis, and Grant's Pass.

Pennsylvania: 1♂, no locality record. 1♀, Bird-in-Hand, July 25, 1901. 1♂, Castle Rock, June 23, (H. Skinner). 1♀, Castle Rock, July 18, 1901. 1♀, Chestertown, Aug. 4, 1902. Also identified from Lake Winola, Mt. Holly, and Philadelphia.

South Dakota: 3♀, Volga. Also identified from Elk Point.

Texas: 6♂, 3♀, no record, (Belfrage). 1♂, Dallas, June 27, (H. S. Barber). 1♂, Dallas, Sept. 4, 1905, (Hunter No. 961; C. N. Bishop, Coll.). 1♂, Devil's River, May 6, 1907, (F. C. Bishop; on *Gaillardia pulchella*). 2♂, Fedor, May 15, and Sept. 23, 1897. 1♂, Weatherford, Parker County, Sept. 3, 1912, 1000-1100 ft., (R. & H.). Also identified from Amarillo, Austin, Calvert, Columbus, Kerrville, Trinity, Victoria, Waco, Wichita Falls, and Willis.

UTAH: 1♂, Silver Lake, July 14, (H. Skinner). Identified also from Huntsville and Salt Lake.

WEST VIRGINIA: 1♀, Wirt County. Identified also from Monongalia.

Specimens of this species have been identified also from the following localities: Arizona—Oak Creek Canyon; British Columbia—Summerland; Idaho—Ashton; Maryland—Cabin John and Glen Echo; North Dakota—Bowman, Churches Ferry, Dickinson, Edgeley, Fargo, Granville, Manango, Mott, Rugby, Steele, Turtle Mts., and Williston: Ohio—Marietta, and Put-in-Bay; Oklahoma—Ardmore; Ontario—Haileybury and Ottawa; Quebec; Rhode Island—Buttonwoods; Saskatchewan—Swift Current; Tennessee; Virginia—Falls Church and Great Falls; Washington—Yakima City; Wisconsin—Milwaukee; and Wyoming—Sheridan.

Flower records.—*Brevis* visits a very wide range of flowers, and there are numerous records for many species of composites, legumes, mints, etc. There are apparently few flowers which it will not visit.

Megachile (Litomegachile) brevis var. **nupta** Cresson

Megachile nupta Cresson, Trans. Am. Ent. Soc., IV, p. 268, 1872. Friese, Das Tierr. Lfg., XXVIII, Apidae 1, p. 242, 1911. Cockerell, Ann. Mag. Nat. Hist., (8), XV, p. 534, 1915. Cresson, Mem. Am. Ent. Soc., I, p. 126, 1916. Cockerell, Proc. Calif. Ac. Sc., (4), XII, p. 554, 1924.

Female.—This form, described as a distinct species, is indistinguishable from typical *brevis* in all respects except the lack of dark pubescence on vertex and mesonotum, and in the inconspicuous nature of the little dark pubescence that does occur on the abdominal terga. It probably represents one extreme in color variation of this species.

Type.—Female; Texas. [A.N.S.P., no. 2449].

Paratype.—Female; Texas, (Belfrage), [U.S.N.M., no. 1786].

Range.—In addition to the type material, there are at hand one female from Montana (undated) and three from Omaha, Nebraska, July 14, 1914, on *Chamacrista fasciculata* (two specimens) and August 20, 1914, (L. T. Williams; on *Solidago canadensis*), [Mitchell].

Megachile (Litomegachile) brevis var. **onobrychidis** Cockerell

Megachile onobrychidis Cockerell, Ann. Mag. Nat. Hist., (8), I, p. 266, 1908.
Megachile perbrevis onobrychidis Cockerell, Ann. Mag. Nat. Hist., (8), XIII, p. 431, 1914.

Female.—This differs from the other forms of *brevis* chiefly in coloration of pubescence, the scopa on the sixth sternum being entirely black, with usually a few black hairs in the scopa of the

fifth laterally or apically, the sixth tergum entirely black pubescent, without any pale tomentum, the second white pubescent, and the punctures of the mesonotum more close than in either *brevis* s. str. or *pseudobrevis*. The pale pubescence of the second tergum and the entirely black tomentum of the sixth will distinguish it from either of these other forms.

Male.—This also is very similar to the other forms, but differs in the total lack of pale tomentum on the sixth tergum and in the much finer puncturation of this segment. In the other forms of *brevis* the disc of the sixth tergum above the carina is largely covered with dense white tomentum which obscures the surface and gives a generally pale aspect to that segment, while the puncturation is not so fine but that the surface appears more or less shining around the margin of the tomentose area. In *onobrychidis* the surface is entirely exposed, with extremely minute and densely crowded punctures, giving the segment a dull and entirely black aspect.

Type.—Male; Mesilla Park, New Mexico, April 25, 1895, (Cockerell), [Cockerell].

Range.—This is a western form, occurring along the Pacific coast and eastward to Nebraska and Texas, being in flight throughout the summer. The following records represent but a portion of the material that has been examined:

California: 1♀, no locality record. 2♂, 1♀, Auburn, July 25, 1915, (L. Bruner). 1♂, Lindsay, (W. A. Davidson; on *Asclepias*). 1♀, 3♂, Los Angeles County, (through C. V. Riley). 1♀, Mokel Hill, (F. E. Blaisdell). 1♂, 5♀, Riverside, June 9, 1926, June 13, 1927, Aug. 3, 1925, Sept. 10, 1925, Sept. 27, 1921 and Nov. 13, 1925, (Timberlake; on *Gutierrezia sarrothrae, Croton californicus, Lotus glaber* and *L. americanus*). 1♂, Sacramento, Sept. 27, 1916, (L. Bruner). Also identified from Jacumba (August), Redlands, and Stanford University.

Colorado: 1♀, Boulder County, June 18, 1925, (Hicks).

Nevada: 1♀, Reno, Aug. 28, 1890, (F. H. Hillman).

Oregon, 2♀, Baker, 3400 ft. elev., July 30, 1929, (H. A. Scullen). 1♂, Minam, (5 miles east of), Wallowa Canyon Fount., 2700 ft. elev., July 21, 1929, (H. A. Scullen). 1♀, Pendleton (8 miles east of), 1900 ft. elev., July 19, 1929, (H. A. Scullen; on *Grindelia* sp.).

Utah: 1♂, 2♀, Salt Lake City, Aug. 24, 1917. 1♂, Salt Lake City, June 27, 1922, (E. P. Van Duzee). 1♀, Provo, July 29, to Aug. 1, 1920. Also identified from Logan.

WASHINGTON: 2♀, Wawawai, (C. V. Piper). Also identified from Pullman.

Additional specimens of *onobrychidis* have been identified from the following localities: Arizona; British Columbia—Okanagan Falls and Summerland; Idaho—Sherman; Nebraska—Lincoln, Mitchell, Nebraska City, Sioux County; and Texas—Fedor.

Megachile (Litomegachile) brevis var. **pseudobrevis** new variety

Female.—This shows only slight structural differences from the usual form. The cheeks are possibly slightly more narrow than in *brevis* s. str., being slightly narrower than the eyes, and the punctures of the clypeus, vertex and mesonotum are slightly more coarse and more widely separated. The general aspect of the sixth tergum is black, as it has only very obscure pale appressed tomentum at most, being otherwise covered with black hairs, and the scopa of the sixth sternum is entirely deep black, entirely white on all the other segments.

Male.—This sex also is hardly distinguishable structurally from the typical form, but in color of pubescence is distinct, being black at least in part on the vertex, mesonotum and fourth and fifth terga, as well as on the third apically, the second to the fifth terga with distinct and entire white apical fasciae, the sixth with dense white tomentum and erect pale hairs.

Type.—Female; Hollywood, Florida, October 27, 1927. (S. Graenicher), [Graenicher].

Allotype.—Male; Miami Beach, Florida, July 5, 1923, (Graenicher), [Graenicher].

Paratypes.—1♂, Hollywood, Florida, July 3, 1927. 13♀, Miami, Florida, March, April, June, July, September, October and December, 1922-1927. 6♀, Miami Beach, Florida, July 5 and 27, 1923. 1♀, S. Miami, Florida, Dec. 19, 1928. 1♀, Stuart, Florida, Sept. 18, 1927. 4♀, Cutler, Florida, Aug. 21, Oct. 2 and Nov. 2, 1927. 2♀, Silver Palm, Florida, Dec. 15, 1927, (all Graenicher), [all Graenicher]. 1♀, Miami, Florida, (A. E. Wright), [M. C. Z]. 1♀, Burgaw, North Carolina, Sept. 10, 1928. 1♀, White Lake, North Carolina, July 22, 1928. 3♂, 6♀, Wilmington, North Carolina, April, June, July and September, 1928-1931. 3♂, 5♀, Carolina Beach, North Carolina, April 20, 1930 (on *Vaccinium*), June 12, 1930 and Sept. 12, 1931. 1♂, Fort Fisher, North Carolina, June 22, 1929. 1♂, 1♀, Lakeview, North Carolina, Sept. 5, 1931. 12♀, Harker's Island, North

Carolina, June 10-12, 1931, on *Crotalaria,* (all Mitchell), [all Mitchell]. 1 ♂, Crestview, Florida, Oct. 13-16, 1914. 1 ♂, Homestead, Florida, Apr. 18, 1923, [both Am. Mus. N. Y.].

Megachile (Litomegachile) coquilletti Cockerell (Pl. I)

Megachile mendica coquilletti Cockerell, Ann. Mag. Nat. Hist., (8), xv, p. 535, 1915.

This species was originally described as a subspecies of *mendica,* but note was made of the fact that it seemed to be rather closely related to *brevis* also. It seems to be sufficiently distinct from all the other closely related species in both sexes however to be considered a valid species. The female has not been described previously. Of the western species it most closely resembles *onobrychidis* from which it may be separated by the larger size, the black pubescence of the scutellum, the slightly more closely punctured clypeus, and by the fact that the fifth segment of the abdomen is definitely grooved across the base.

Female.—Size: Length 11 to 12 mm.; breadth of abdomen 4 to 4.3 mm.; anterior wing 8 to 9 mm.

Structure: Face slightly broader than long; eyes slightly convergent below; clypeal margin smooth and entire; mandibles distinctly 4-dentate, the emargination between the third and fourth teeth not angulate; lateral ocelli very slightly nearer edge of vertex than to eyes; vertex flattened; cheeks subequal in width to eyes; second and third adbominal terga rather deeply grooved across base, the grooves on the fourth and fifth more shallow but distinct, apical margins of the second to the fifth slightly depressed laterally, but very slightly so medially, the sixth somewhat concave laterally but nearly straight in profile, with abundant erect hair visible in profile.

Puncturation: Fine and close on cheeks, pleura above, and over most of the scutellum; rather shallow and indistinct on the cheeks; deeper but rather fine and close on vertex medially and on mesonotum anteriorly and posteriorly, more coarse and sparse on vertex laterally and mesonotum medially; rather coarse and close on pleura below; quite coarse on clypeus, close laterally, more distinct near center; coarse and quite sparse on supraclypeal area; fine over most of abdomen, minute and close basally, quite distinctly separated but hardly sparse toward segment five, fine and densely crowded on segment six.

Color: Black; antennae and tegulae piceous; wings subhyaline, slightly clouded apically, the nervures piceous; spurs yellow.

Pubescence: Black or fuscous on vertex, mesonotum, scutellum and discs of abdominal terga three to five; otherwise white on head, thorax, legs,

and first and second terga; first to fifth terga with entire white apical fasciae, thin on the more basal segments; sixth tergum with both the erect hairs and appressed apical tomentum fuscous or black; scopa white, black on the sixth sternum.

Male.—Size: Length 9 to 12 mm.; breadth of abdomen 2.5 to 3.5 mm.; anterior wing 6 to 8 mm.

Structure: Face about as broad as long; eyes slightly convergent below; clypeal margin with a rather broad and shallow median incurved area; inferior projection of mandible slender, subbasal and acute; lateral ocelli subequally distant from eyes and edge of vertex; vertex flattened; cheeks subequal in width to eyes; coxal spines short but rather robust, subacute, usually obscured by pubescence; second to fifth abdominal terga quite deeply grooved across base, the apical margins of the fourth and fifth abruptly and quite deeply depressed, distinctly depressed only at the sides of the second and third; sixth tergum vertical in position, the carina quite conspicuous, with a deep semicircular median emargination, finely and irregularly denticulate on each side, the median carinate teeth of the apical margin of the segment triangularly pointed and slightly nearer the small lateral teeth than to each other; seventh tergum visible, slightly protuberant medially.

Sternites: Median area of fifth presternite about half the length of the medasternite, the latter about three times longer than broad and uniformly covered with minute setae which are dilated apically, poststernal strip conspicuously outcurved on each side of middle; lateral portions of sixth presternite long and narrow, slightly angulate apically, the medasternal areas linear, well separated medially, each with a single row of robust curved setae, poststernal lobe short and broad, lateral angles acutely produced.

Genital armature: Stipites narrowed above base, flattened and slightly dilated above this, the tip recurved and acute; sagittae relatively straight, the tips barely exceeding the tips of the stipites; volsellae triangular.

Puncturation: Close and quite fine on cheeks and over entire thorax; more deep and distinct on vertex, rather fine medially, slightly more coarse laterally, but quite close over entire width; very fine and close on abdomen basally, becoming more coarse deep and distinct toward the fifth segment, more distinctly separated on the fourth, very fine and close on the sixth which has scattered obscure tubercles in addition, but these often obscured by the dense tomentum.

Color: Black; antennae and tegulae piceous or black; wings subhyaline basally, slightly clouded apically, the nervures piceous; front femur polished ferruginous on anterior face, dark on posterior face, the upper one more or less reddened; front tibia largely dark, slightly reddened on the two inner faces; front metatarsus black, but the joints beyond this distinctly yellowish-ferruginous, contrasting with the dark basal segment; mid and hind legs entirely black; spurs pale yellow.

Pubescence: Pale ochraceous or whitish on head, thorax, legs and basal segments of abdomen, with no dark admixture whatever; more or less

blackish on the fourth and fifth segments apically, but entirely pale on the sixth, the fourth and fifth with rather conspicuous white tomentum basally, the second to the fourth with entire white apical fasciae, that on the fifth evident only at the extreme sides, the sixth with dense pale tomentum obscuring most of the surface.

Type.—Male; Paris, Texas. May 24, 1904. (Bishop). [U. S.N.M., no. 21747].

Range.—This is a western species, occurring from southern California to British Columbia, extending eastward into Idaho and Utah. Definite records include the following:

CALIFORNIA: 2♂, 7♀, no locality record. 3♂, Auburn, July 25 & 27, 1915, (L. Bruner). 1♂, Diablo Mts., Alcalde, Aug. 6, 1927, (Cornell Univ.). 1♀, middle fork Kaweah River, Sequoia National Park, Aug. 6, 1915, 1700 ft. 1♀, Los Angeles, June 22, 1926, (Hicks). 1♀, Reading, July 17, 1918, (E. P. Van Duzee). 1♂, Southern Sonoma County, July 10, 1910, (J. A. Kusche). 1♀, Santa Monica, July, 1910, (F. C. Clark). Also identified from Coalings, Pasadena, Stanford University and Warrens.

NEVADA: 1♀, Reno, June 26, 1927, (E. P. Van Duzee).

NEW MEXICO: 1♀, Las Cruces, May 19, 1916, (A. D. Saunders), [U.S. N.M].

OREGON: 8♂, Burns, elev. 4150 ft., July 16, 1927, (H. A. Scullen). 2♂, Gold Hill, July 2, 1925, (H. A. Scullen). 1♀, Grave Creek, Josephine County, June 30, 1925, (G. R. McGinnis). 2♀, Wildhorse Canyon, Andrews, elev. 4270 ft., July 4, 1927, (H. A. Scullen).

UTAH: 2♂, Logan, July 12, 1911.

Additional specimens of *coquilletti* have been identified as follows: British Columbia—Okanagan Falls and Vernon; Idaho; Washington—Pullman, Wawawai and Yakima City.

Flower records.—Eriogonum elatum and *Cleomis serrulata.*

Megachile (Litomegachile) gentilis Cresson (Pl. I)

Megachile gentilis Cresson, Trans. Am. Ent. Soc., IV, p. 267, 1872. Cresson, Mem. Am. Ent. Soc., I, p. 119, 1916.

Megachile palmarum Perkins, Fauna Hawaiiensis, I, p. 114, 1899.

Megachile murinella Cockerell, Ann. Mag. Nat. Hist, (8), I, p. 263, 1908. Cockerell, Proc. Calif. Ac. Sc., (4), XII, p. 554, 1924.

This species is a close affinity of *mendica,* showing but relatively minor differences from that species. The females may be readily distinguished from those of *mendica* by the black scopa of the sixth sternum and by the slightly concave sixth tergum, as well as by the relatively more conspicuous abdominal fasciae. The males average smaller (although the extremes do not seem

to indicate this) and the punctures are relatively more fine and close, while the hidden fifth sternum differs in the ratio of length along the median line of the presternite and medasternite, these being subequal, whereas in *mendica* the medasternite is considerably longer.

Specimens of *M. palmarum* Perkins, from Hawaii, identified by Mr. P. H. Timberlake, are identical with *gentilis,* and it is quite probable therefore that this was introduced from this continent into the islands.

Female.—Size: Length 10 to 12 mm.; breadth of abdomen 3.5 to 4 mm.; anterior wing 6.5 to 7.5 mm.

Structure: Face somewhat broader than long; eyes convergent below; clypeal margin straight and entire; mandibles 4-dentate, but the emargination between the third and fourth teeth slightly angulate; lateral ocelli subequally distant from eyes and edge of vertex; vertex flat; cheeks subequal to eyes in width; second and third abdominal segments grooved across base, the fourth somewhat less so, the apical margins of the second to the fifth only slightly depressed laterally and not at all medially, the sixth slightly concave laterally in dorsal aspect, very slightly concave in profile, with abundant erect hairs visible toward the base.

Puncturation: Shallow and close on cheeks; fine and close on pleura above and on scutellum laterally; quite coarse and close on face, clypeus laterally and on pleura below; deep, distinct and quite coarse on clypeus, vertex and mesonotum, distinctly separated but hardly sparse on clypeus and mesonotum medially and on vertex laterally; sparse on supraclypeal area medially; very fine and close on abdomen basally, becoming deep, rather coarse and well separated toward segment five, minute and densely crowded on the sixth.

Color: Black; antennae beneath and tegulae piceous; wings subhyaline, slightly clouded apically, nervures ferruginous; spurs yellow.

Pubescence: Black on vertex and on third to sixth abdominal segments, the mesonotum and scutellum with short inconspicuous dark hairs intermixed with white, or with the pubescence largely black; otherwise white on head, thorax, legs, and first and second segments of abdomen; the first to the fifth segments with entire but rather narrow white apical fasciae, the sixth with no pale pubescence of any sort, both the erect basal hairs and the appressed tomentum being black or fuscous; scopa white, black on the sixth sternum and across the fifth apically.

Male.—Size: Length 8 to 10 mm.; breadth of abdomen 2.5 to 3.3 mm.; anterior wing 5 to 6.5 mm.

Structure: Face very slightly broader than long; eyes slightly convergent below; clypeal margin very slightly incurved medially, otherwise entire; inferior mandibular projection subbasal, rather slender and acute; lateral ocelli slightly nearer eyes than to edge of vertex; vertex flattened; cheeks somewhat narrower than eyes; coxal spines short, rather robust,

rounded apically, usually obscured by the pubescence; second to fifth abdominal segments distinctly grooved across base, deeply so on the second and third, apical margins of the fourth and fifth quite deeply and abruptly depressed, much less so on the second and third; sixth tergum vertical in position, the carina rather low but with a definite semicircular median emargination, very slightly crenulate on each side, the median teeth of the apical margin of the segment relatively acute, about equidistant from each other and from the low lateral teeth; seventh tergum barely visible, sometimes with a very slight median protuberance.

Sternites: Fifth presternite extensive, not much shorter than the medasternite medially, the latter relatively small, uniformly covered with microscopic setae, the poststernal strip outcurved and conspicuous on each side of middle, slightly emarginated at center; lateral portions of sixth presternite subtriangular, the medasternal areas short, linear, well separated medially, but with a few minute setae basad of the single row or robust curved setae, the poststernal lobe broad and short, with rather acute lateral angles.

Genital armature: Stipites narrowed above base, dilated and flattened toward apex, but this narrowed, flexed dorso-laterally, the tips subacute; sagittae relatively straight and slender, the tips considerably exceeding the stipites; volsellae triangular apically.

Puncturation: Fine and close on cheeks, pleura, scutellum, and around margin of mesonotum; shallow and indistinct on cheeks; somewhat more coarse and definitely separated on mesonotum medially; deep and more distinct on vertex, rather close medially, slightly more sparse laterally; close over most of abdomen, fine basally, more coarse deep and distinct toward the fifth segment, very fine and close on the sixth.

Color: Black; antennae deep ferruginous to piceous beneath; tegulae ferruginous to piceous; wings subhyaline basally, slightly clouded apically, the nervures ferruginous to piceous; front femur dark on posterior face and front tibia on the outer face, the other two faces of each reddened or ferruginous; spurs yellow.

Pubescence: Blackish on vertex and mesonotum, more or less intermixed with longer pale hairs; otherwise pale ochraceous or white on head, thorax, legs and the first and second abdominal segments; black and quite short on discs of third to fifth segments, longer on the fifth, the first to the fourth with entire pale apical fasciae, this entirely lacking on the fifth, the sixth with dense pale tomentum and erect pale hairs, contrasting strongly with the black pubescence of the fifth, the third to the fifth with only slight amounts of pale tomentum basally.

Type.—Male; Texas. [A.N.S.P., no. 2720].

Range.—This is a western species, ranging from California and Oregon eastward to Texas and Idaho. Definite records include the following:

ARIZONA: 1♂, no locality record. 1♂, Rio Aravaipa, 2500 ft. 1♀, Yuma, 1899, (A. Brown). Other specimens have been seen from Bill Williams Fork, (Aug.), Oak Creek Canyon, (Aug.), Tempe, (July) and Tucson, (Aug.).

CALIFORNIA: 6♂, Auburn, July 27, 1925, (L. Bruner). 4♂, Idlewild, June 23 & 24, 1928, (E. P. Van Duzee). 2♂, Laguna Mts., 6000 ft., Aug. 23, 1924, (E. P. Van Duzee). 1♂, Los Angeles, June 22, 1926, (Hicks). 1♀, Poway, San Diego County, Aug. 11, 1886, (F. E. Blaisdell). 1♂, Redlands, 1913, (F. R. Cole). 2♂, 2♀, Riverside, Aug. 11 and Sept. 23, 1925, Aug. 30 and Sept. 10, 1926, (Timberlake; on *Gutierrezia sarrothrae, Eriogonum fasciculata* and *E. gracila*). 1♀, Southern Sonoma County, June 26, 1910, (J. A. Kusche). 2♂, Yosemite, July 20, 1905, (J. McFarland). 1♂, 3♀, Yosemite Valley, June 24 & 27, 1926, (Timberlake; on *Lotus nevadensis*). 1♀, Shasta County. 1♀, Cuyamacha Lake, San Diego County, July 7-14, 1919, elev. 5000 ft. Also identified from Bard (Aug.), Chico (Sept.), Descanso (Aug.) and Lake Taho (Aug.).

TEXAS: 2♂, 10♀, Bexar County, May 30, June 1 and July 3, 1929, (H. B. Parks). 1♀, New Braunfels, May 17, 1906, (J. C. Crawford; on *Ratibida columnaris,* labelled *Megachile brevis* var. *muriella* Ckll). 4♂, 3♀, Burnsville, 1904 (H. S. Barber; bred). 1♀, Devil's Riv., May 6, 1907, (F. C. Pratt; on *Monarda citriodora,* labelled *M. perbrevis* by Cockerell). Also identified from Austin (May), Brownwood, Dallas, Kennedy, Kerrville, Lee County (July), Newcrest, Pecos, Sabinal and Victoria.

Gentilis has also been identified from Nevada, New Mexico and Oregon.

Flower records.—Lotus nevadensis, Eriogonum fasciculatum and *E. gracila.* Judging by the length of the flight period, a more complete list of the flowers which this species visits would probably be a long one.

Megachile (Litomegachile) mendica Cresson (Pl. I)

Megachile mendica Cresson, Trans. Am. Ent. Soc., VII, p. 126, 1878. Provancher, Nat. Can; XIII, p. 231, 1882, (= *latimanus*). Provancher, Pet. Fauna Ent. Can., pp. 710 & 715, 1883, (= *latimanus*). Robertson, Trans. Ac. St. Louis, VII, p. 352, 1897. Fox, Ent. News, XI, p. 553, 1900. Robertson, Trans. Am. Ent. Soc., XXIX, p. 172, 1903. Cockerell, Can. Ent., XXXV, p. 216, 1903. Friese, Das Tierr. Lfg., XXVIII, Apidae 1, p. 241, 1911. Cockerell, Ann. Mag. Nat. Hist., (8), XIV, p. 362, 1914. Cresson, Mem. Am. Ent. Soc., I, p. 123, 1916. Graenicher, Ann. Ent. Soc. Am., XXIII, p. 163, 1930.

Megachile (*Megachile*) *mendica* Viereck, Connecticut Nat. Hist. Surv. Bull., XXII, p. 742, 1916.

Female.—Size: Length 11 to 13 mm.; breadth of abdomen 4 to 4.5 mm.; anterior wing 7.5 to 8 mm.

Structure: Face slightly broader than long; eyes slightly convergent below; clypeal margin straight and entire; mandibles 4-dentate, but the emargination between the third and fourth teeth angulate; lateral ocelli

subequally distant from eyes and edge of vertex; vertex flattened; cheeks very slightly narrower than eyes or subequal; second to fourth abdominal segments slightly grooved across base, the apical margins of the second to the fifth quite deeply depressed laterally but not at all medially, the sixth nearly straight laterally, straight in profile, with only a few suberect hairs visible toward the base.

Puncturation: Shallow and close on cheeks; close and quite fine on face, pleura above, scutellum, and around margin of mesonotum; somewhat more coarse deep and distinct on vertex and mesonotum, rather sparse in center of mesonotum and on vertex laterally, the mesonotum tessellate, the vertex shining; coarse and deep on clypeus and supraclypeal area, sparse medially, close laterally; fine and close on abdomen basally, becoming quite coarse and rather sparse toward the fifth segment, very fine and densely crowded on the sixth.

Color: Black; antennae and tegulae piceous or black; wings subhyaline, slightly clouded apically, the nervures brownish to piceous; spurs yellow.

Pubescence: Black on vertex, mesonotum, scutellum and discs of the second to sixth abdominal segments; otherwise white or pale ochraceous on head, thorax, legs and first segment of abdomen; second to fifth segments with thin white apical fasciae, often more or less interrupted medially, the sixth covered with fine appressed fuscous tomentum, with erect black hairs laterally near base; scopa ochraceous or pale fulvous, black apically on the sixth sternum.

Male.—Size: Length 8 to 10 mm.; breadth of abdomen 2.5 to 3.5 mm.; anterior wing 6 to 7 mm.

Structure: Face but very slightly broader than long; eyes slightly convergent below; clypeal margin with a shallow but rather broad median incurved area; inferior mandibular projection subbasal, slender and acute; lateral ocelli subequally distant from eyes and edge of vertex; vertex nearly flat; cheeks slightly narrower than eyes; coxal spines short, subacute, largely hidden by pubescence; second to fourth abdominal segments deeply grooved across base, the fifth considerably less so, the apical margins of the second to the fifth quite deeply and abruptly depressed laterally, only slightly so medially on the third, and not at all on the second medially, deeply so on the fifth; sixth tergum vertical in position, the carina with a quite definite semicircular median emargination, slightly and irregularly crenulate on each side, median teeth of the apical margin very low, equidistant from each other and from the acute lateral teeth, or slightly nearer to each other; seventh tergum almost entirely hidden, but with a slight median protuberance usually visible.

Sternites: Fifth presternite extensive, the median portion slightly more than half as long as the medasternite medially, the latter about twice as broad as long, uniformly covered with microscopic setae, the poststernal strip outcurved on each side; lateral portions of sixth presternite somewhat longer than broad, the medasternal areas separated medially, each with a

single apical row of robust curved setae and one or two additional rows of minute setae, the poststernal lobe broad and short, its apical margin nearly straight, with the lateral angles prominent and acute.

Genital armature: Stipites narrowed above base, flattened apically, the tip narrowed, subacute, flexed dorso-laterally; sagittae more nearly straight, rather slender, the tips considerably exceeding the stipites; volsellae triangularly acute.

Puncturation: Fine and close on cheeks, pleura, scutellum and on mesonotum laterally; more coarse, deep and sparse on vertex and on mesonotum medially; close and fine on abdomen basally, becoming more coarse and deep apically, rather sparse on the fourth segment medially, otherwise rather close, very fine and close on the sixth.

Color: Black; antennae and tegulae piceous or black; wings subhyaline, slightly clouded apically, the nervures ferruginous; front femur reddened on upper face, ferruginous on the anterior face, the legs otherwise black; spurs yellow.

Pubescence: Black or fuscous on vertex and on discs of third to fifth abdominal segments, with more or less of an intermixture of fuscous hairs on mesonotum and sometimes at sides of scutellum; otherwise ochraceous or whitish on head, thorax, legs and on the first, second and sixth terga, the second to the fourth with pale apical fasciae which are thin or interrupted medially, the fifth segment entirely lacking such a fascia, the sixth with dense pale tomentum and erect pale hairs above the carina, this contrasting conspicuously with the black pubescence and non-fasciate fifth segment, the latter however with a slight amount of pale tomentum across the base.

Type.—Female; Pennsylvania. [A.N.S.P., no. 2446].

Range. This is widely distributed through the Nearctic region, occurring from Florida to New England and southern Canada in the East, and extending west to California. It is in flight throughout the warm seasons. Literally thousands of specimens have been identified in the various collections of bees studied, and records are therefore numerous. A partial list of the records includes the following:

ALABAMA: 1♀, Mobile.

ARIZONA: 2♂, near Kits Peak, Baboquivari Mts., Aug. 7-9, 1916. Also identified from Bear Wallow, Fort Grant, Lowell Ranger Sta., Pinalano Mts., Rio Aravaipa, St. Catalina Mts., and Tucson.

COLORADO: 1♀, Denver, July 12, 1907, (on garden Hollyhock). Identified also from Boulder, Colorado Springs, and Jim Creek.

CONNECTICUT: 3♂, 2♀, Hartford, July 30, and Aug. 27, 1893, July 2, 1892, (identified as *latimanus*), and Aug. 6, 1897, (on *Koellia mutica*). 1♀, Wallingford, Aug. 17. Identified also from Colebrook, July-Sept., and Lyme.

FLORIDA: 1♀, no locality record. 1♂, Crescent City. 1♀, Miami, April 11-21, 1923. 1♀, Monticello, Oct. 4-5, 1914. 2♀, Royal Palm Park, April 12-18, 1923. Also identified from Cedar Keys, Crestview, Deep Lake, De Funiak Springs, and Homestead.

GEORGIA: 3♀, no locality record. 1♀, Brunswick, June 1, 1922. 2♂, St. Simons, June 2, 1922. 8♂, 3♀, Thalman, June 3, 1922; (all Mitchell). 9♂, 1♀, Tifton, May 19 to June 21, 1896. Also identified from Roswell and Savannah.

ILLINOIS: 1♂, no locality record. 1♂, Algonquin, July 30, 1894. 1♂, 4♀, Beverly Hills, Aug. 16, 1903, (W. J. Gerhard). Identified also from Chicago and Fort Sheridan.

KENTUCKY: 1♀, Cumberland Gap, (Geo. Dimmock). Identified also from Maud and Sanborn.

MASSACHUSETTS: 1♂, Dedham, Sept. 4. 1♀, Fairhaven, June 27, 1926, (Mitchell). 1♂, Forest Hills, Aug. 19, 1926, (Geo. Salt). 2♀, Forest Hills, June 21 and 30, 1927, (Mitchell; on *Vicia*). 1♀, Mattapoisett, July 15, 1927, (Mitchell). 2♂, Needham, June 1 and 20, 1921, (Mitchell; on *Trifolium*). 2♀, Southbridge, July 19, 1921. 1♂, Woods Hole, July 25. Also identified from Blue Hill, Brookline, Holliston, Lexington, Scituate, Stoney Brook, and Wareham.

MISSISSIPPI: 1♂, no data, (W. H. Ashmead). Identified from Utica.

MISSOURI: 2♂, Columbia, June 7, 1923, (Bromley).

NEBRASKA: 3♂, Lincoln, May, June, and July. 1♂, Monroe Canyon, Sioux County, Aug. 3, 1908, (R. W. Dawson; on damp ground). 1♂, West Point. 2♀, West Point, Aug. 15 & Sept. 1, 1903, (J. C. Crawford; on *Cassia chamaecrista* and *Campanula*). Also identified from Ashland, Cedar Bluffs, Dawes County, Fairmont, Malcom, Nebraska City, Omaha, South Bend, Union, War Bonnet Canyon, and Weeping Water.

NEW JERSEY: 1♂, no locality record. 1♀, Anglesea, Sept. 2, 1902, (J. C. Bradley). 2♂, Avalon, June 9, and July 5, 1897. 1♂, Clementon, Aug. 13, 1899. 1♀, Clementon, Sept. 10, (H. Hornig). 2♂, Da Costa, July 19, 1903. 1♀, Glasboro. 1♀, Merchantville, Aug. 13, (H. Hornig). 5♂, North Woodbury, June 13, and Aug. 1, 1901. 1♂, 1♀, Ocean Grove, July 10 and 13, 1893. 1♀, Riverton, Sept. 8, 1901. 2♂, 1♀, Westville, June 19, 1897, May 28, 1899, and Aug. 1, 1901. Identified also from Arlington, Fort Lee, Millburn, Palisades, Ramsey, Trenton, and West Englewood.

NORTH CAROLINA: 3♂, no locality record. 7♂, 1♀, Aberdeen, June 28, 1930. 1♂, 1♀, Bogue, Aug. 7, 1930, (on *Clethra*). 2♂, Bolton, April 25, 1923, (on *Rubus*). 5♂, 7♀, Burgaw, July 18, 1928, (on *Koellia*). 3♂, Busick, Sept. 1, 1929. 1♀, Carolina Beach, Sept. 11, 1928. 1♂, Cary, Sept. 13, 1923, (on purple Gerardia). 4♂, Flat Rock, July 21, 1921. 4♂, 1♀, Goldsboro, July 28, 1921 and June 20, 1929, (*Baptisia, Cephalanthus,* and *Polygala incarnata*). 2♂, Greensboro, Aug. 28, 1921. 7♂, 2♀, Harker's Island, June 10 & 11, 1931. 3♀, Harnett County, June 5, 1921, (on *Tephrosia*), and Sept. 30, 1933. 3♂, Hendersonville, July 12, 1923, (on *Asclepias tuberosa*). 10♂, Highlands, July 24 & 25, 1922, and July 28,

1925, (on *Coreopsis stellata* and *Pycnanthemum*). 1♂, 1♀, Hoffman, July 4, 1928 and Sept. 5, 1931. 1♂, Jonesboro, June 6, 1922. 2♂, 3♀, Kingsboro, June 9, 1932, (on *Trifolium*), and Aug. 2, 1932, (on soybeans). 6♀, Lakeview, Sept. 5, 1931 and Sept. 23, 1933, (on blue Gerardia). 4♂, Lumberton, June 22, 1928, (on *Koellia*). 1♀, Manteo, July 6, 1929. 25♂, 9♀, Marion, July 8 to Aug. 31, (on *Solidago, Polygala* and *Vernonia glauca*). 1♂, Mars Hill, July 6, 1928. 3♂, McCullers, Sept. 14, 1923, (on *Polygonum*). 5♂, 1♀, Merry Oaks, May 27, 1926, (on *Tephrosia*). 2♂, Moncure, Oct. 6, 1921, (on mud flat). 2♀, Moore County, Sept. 10, 1931. 1♂, 1♀, Mt. Mitchell, Aug. 24, 1933. 1♂, New Bern, May 16, 1923, (on *Oenothera*). 4♂, Overhills, Sept. 13, 1921, (on cultivated *Buddleia*). 1♂, Pilot Mt., July 19, 1931. 4♂, Plymouth-Wenona turnpike, Sept, 20, 1923, (on *Conoclinum caelestinum* and *Elephantopus carolinianus*). 1♂, 1♀, Poplar Branch, July 5, 1929. 42♂, 12♀, Raleigh, April 27 to Oct. 16, (on *Rubus, Lupinus, Oenothera, Tephrosia, Helenium, Strophostyles, Koellia, Geranium*, and *Zizia*). 1♀, Rollsville, May 16, 1932, (on *Rubus*). 1♂, Sanford, June 6, 1922. 1♀, Southport, June 23, 1928, (on *Hypericum*). 1♀, Spout Springs, Sept. 11, 1929. 1♂, 2♀, Tarheel, July 22, 1928, (on *Galactia* and *Helenium*). 3♀, White Lake, July 22, 1928. 4♂, 2♀, Willard, July 6, 1922, July 2, 1933, and June 22, 1929, (on *Koellia* and *Senecio*). 8♂, 22♀, Wilmington, June 22 to Sept. 21, (on cultivated beans, *Galactia, Cephalanthus*, and *Senecio*); (all Mitchell).

OHIO: 1♀, Lake Lab., Cedar Point, July 2, 1917. Also identified from Columbus, Marietta, Put-in-Bay, and Smithfield.

PENNSYLVANIA: 1♂, no locality record. 1♀, Castle Rock, July 18, 1901. 1♀, Fairview, Aug. 18, 1902, (J. C. Bradley). 2♂, 8♀, Lehigh Gap, June 25-29, July 1 & 12 and Sept. 3, 1897-1901. 3♂, 1♀, Philadelphia, July 23, 1890 and Aug. 28, 1897. 1♀, St. Vincent. 1♀, Swarthmore, July 8, 1906. 1♂, White Haven, Aug. 1902, (J. C. Bradley). Identified also from Camphill, Carlysle, Enola, Forge, Harrisburg, Highspire, Inglenook, Linglestown, Martic and North Cumberland.

TENNESSEE: 1♀, Sevier County, Sept. 5, 1927, (W. W. Stanley).

TEXAS: 2♀, no locality record. Identified from Austin, Dallas, Fedor, Greenville, Lee County, and Richmond.

VIRGINIA: 5♂, 1♀, no locality record. 1♀, Ft. Humphreys, Aug. 5, 1928, (Timberlake). Also identified from Chain Bridge, Dyke, Falls Church, Glen Carlyne, Great Falls, Lee County, and Pennington Gap.

WEST VIRGINIA: 1♂, Wirt County. Identified also from Baileysville, and Monongalia.

Additional localities from which *mendica* has been identified are as follows: Arkansas—Marion County; California—Auburn, Los Angeles, Placer County, Redlands, Sacramento; District of Columbia; Indiana—Lafayette, Vincennes: Iowa—Vinton; Kansas—Baldwin, Riley County; Louisianna—Berwick; Maine—Southwest Harbor; Maryland—Cabin John, Glen Echo, Lakeland, Plummer's Island; Michigan—Ann Arbor, Grand Rapids; Minnesota; New Hampshire; New York—Brooklyn, Flushing, Gardiner's Island, Ithaca, Lake Ridge, Orient, Tottenville; Ontario—Point

Pelee; South Carolina—Dillon; South Dakota—Custer; Vermont—Rutland; and Wisconsin.

Flower records.—*Mendica* is very generalized so far as its flower-visiting habits are concerned, and is relatively unlimited in this respect, although species of legumes and composites seem to be more numerous in the list of flowers on which specimens have been caught.

Megachile (Litomegachile) mendica var. **snowi** Mitchell

Megachile cleomis (male) Cockerell, Ann. Mag. Nat. Hist., (7), VI, p. 13, 1900.

Megachile mendica snowi Mitchell, Psyche, XXXIV, p. 113, 1927.

This variant of *mendica* is the insect referred to in Cockerell's description of the male *cleomis*. The two cotypes (male and female) of *cleomis* have been examined and they represent variants of two distinct species, the male being the same as *mendica* var. *snowi* and the female being a variant of *texana* (*generosa*).

This variety, as well as *mendica* s. str. exhibits some variability in the character of the first abdominal sternum in that it often appears to be much lengthened, sometimes projecting as far as the apical margin of the second segment. This condition is often accentuated if the abdomen is flexed ventrally, resulting in a shortening of the visible portions of the sterna except the first. One such specimen was described in manuscript as a distinct variety, but examination of some numbers of individuals showed all possible intergradations between the extremes.

Female.—Differs from typical *mendica* by the pale pubescent first and second segments of the abdomen, and the pale appressed tomentum of the sixth, while the dark pubescence of the vertex and mesonotum is more or less diluted with pale hairs.

Male.—Differs from *mendica* principally in the possession of a definite white apical fascia on the fifth abdominal segment, this being definitely lacking in typical *mendica*.

Type.—Female; Oak Creek Canyon, Arizona. (Snow). [M. C.Z., no. 15719].

Range.—This form appears to be limited to the southwestern United States, as shown by the following records:

ARIZONA: 1♂, S. Arizona, Aug. 1902, (F. H. Snow), [Cornell Univ.]. 6♂, 1♀, and 1♀ (paratype), Oak Creek Canyon, 6,000 ft., July and Aug., (F. H. Snow), [Mitchell]. 1♂, Ramsey Canyon, Huachuca Mts., (W. H. Mann), [U.S.N.M.]. 1♂, Tucson, (F. H. Snow), [Mitchell]. 1♂, Mud Springs, Santa Catalina Mts., July 17-20, 1916, [Am. Mus. N.Y.].

COLORADO: 1♂, Boulder County, June 13, 1925, (C. P. Custer), [Mitchell]. 9♂, Boulder County, June 16-21, Aug. 15-26, 1925, (Hicks), [Hicks]. 2♂, Boulder, June 20, 1922. 1♂, Boulder, May 28, 1913, (M. D. Ellis; on privet), [Am. Mus. N.Y.]. 1♂, Hubbard Ranch, Elbert, June 9, (Figgins; on *Gilia*), [Univ. Colo.].

NEW MEXICO: 1♂, Highrolls, June 3, 1902, [A.N.S.P.]. 4♂, Jemez Springs, 6400 ft., June 14, 1916 and June 27, 1914, (John Woodgate), [Mitchell].

Megachile (Litomegachile) texana Cresson (Pl. I)

Megachile texana (male) Cresson, Trans. Am. Ent. Soc., VII, p. 125, 1878, (female=*paratexana* Mitchell). Cockerell, Denison Univ. Bull., XI, p. 65, 1898, (male only). Friese, Das Tierr. Lfg., XXVIII, Apidae 1, p. 247, 1911, (female=*paratexana* Mitchell). Cresson, Mem. Am. Ent. Soc., I, p. 132.

Megachile generosa (female) Cresson, Trans. Am. Ent. Soc., VII, p. 125, 1878. Robertson, Trans. Am. Ent. Soc., XXIX, p. 172, 1903. Friese, Das Tierr. Lfg., XXVIII, Apidae 1, p. 238, 1911, (female only). Cockerell, Ann. Mag. Nat. Hist., (8), XI, p. 536, 1913. Cresson, Mem. Am. Ent. Soc., I, p. 119, 1916. Cockerell, Proc. Calif. Ac. Sc., (4), XII, p. 546, 1924. Grenicher, Ann. Ent. Soc. Am., XXIII, p. 163, 1930.

Megachile schismatura Cockerell, Ann. Mag. Nat. Hist., (8), I, p. 267, 1908.

Megachile vernonensis (male) Cockerell, Can. Ent., XLIV, p. 354, 1912.

Megachile (*Megachile*) *generosa* Viereck, Connecticut Nat. Hist. Surv. Bull., XXII, p. 742, 1916.

There has been some confusion of names in this species, due to the fact that the male and female originally described as *texana* were not correctly correlated, being of two distinct species. The male was subsequently designated as the type, and as it is the male of *generosa* and as the description of *texana* precedes that of *generosa*, the name *texana* has priority.

Female.—Size: Length 11 to 14 mm.; breadth of abdomen 4 to 5 mm.; anterior wing 8 to 9 mm.

Structure: Face broader than long; eyes slightly convergent below; clypeal margin straight and entire; mandibles distinctly 4-dentate, the emargination between the third and fourth teeth not angulate; lateral ocelli subequally distant from eyes and edge of vertex; vertex flattened; cheeks subequal to eyes in width; second to fourth abdominal segments deeply grooved across base, more so on the more basal segments, apical

margins of these segments deeply and abruptly depressed laterally, medially also on the more apical segments, the sixth deeply concave laterally, this visible in profile, and with abundant erect hairs visible in profile.

Puncturation: Fine and indistinct on cheeks; crowded and moderately fine on pleura; more coarse deep and distinct on clypeus and vertex, well separated over most of vertex, close on clypeus laterally, rather sparse medially, the surface shining; rather coarse and distinct on mesonotum, sparse medially, the surface tessellated; quite fine on scutellum, close laterally; very fine over most of abdomen, close basally, becoming more distinct and more widely separated toward segment five, very fine and densely crowded on segment six.

Color: Black; antennae piceous beneath; tegulae dark ferruginous or piceous; wings subhyaline, slightly darker apically, the nervures piceous; spurs yellow.

Pubescence: Whitish on face, cheeks, pleura, propodeum and over legs in large part; short and black on vertex, mesonotum and scutellum, as also on discs of second to fifth abdominal segments, the first segment black pubescent medially, white laterally, the sixth with whitish tomentum and erect black hairs; segments one to five with entire white apical fasciae, very thin on the first segment; scopa white or creamy, black in part on the fifth sternum, entirely black on the sixth.

Male.—Size: Length 10 to 12 mm.; breadth of abdomen 3.5 to 4 mm.; anterior wing 7.5 to 8.5 mm.

Structure: Face broader than long; eyes slightly convergent below; clypeal margin entire, very nearly straight; inferior mandibular projection basal, rather slender and acute; lateral ocelli subequally distant from eyes and edge of vertex; vertex flattened; cheeks subequal to eyes in width; coxal spines rather short, acute, largely hidden by pubescence; second to fifth abdominal segments deeply grooved across base, their apical margins deeply and abruptly depressed except on the second segment medially; sixth segment nearly vertical in position, the carina rather low, with a usually conspicuous semicircular median emargination, irregularly dentate on each side, median teeth of the apical margin triangularly acute, slightly nearer the lateral teeth than to each other; seventh segment barely visible, transverse, not protuberant medially.

Sternites: Fifth presternite much shortened medially, but not linear, the length medially about one third the length of the medasternite, the latter about four times broader than long, rounded laterally, uniformly covered with fine setae, the poststernal strip broadly incurved, conspicuous laterally; lateral portions of sixth presternite much longer than broad, rounded apically, medasternal areas more or less linear, widely separated medially, each with a double row of robust curved setae and some scattered minute ones, the poststernal lobe broad and short, its apical margin outcurved medially, the lateral angles acutely produced.

Genital armature: Stipites slightly constricted above base, flattened and slightly sinuate toward the abruptly dorso-laterally flexed tips which are acute; sagittae quite robust, the tips slightly exceeding the stipites; volsellae triangular, the tips more or less rounded.

Puncturation: Fine and close on cheeks, pleura, on scutellum laterally and over most of mesonotum, but more coarse and sparse on mesonotum medially; very fine and more distinctly separated on scutellum medially; deep, distinct and moderately coarse on vertex, more close medially, quite sparse laterally; quite close over most of abdomen, although the surface is shining, very close and fine basally, more distinct and coarse apically.

Color: Black; antennae brownish-piceous beneath; tegulae deep ferruginous; wings subhyaline, faintly clouded apically, the nervures ferruginous to piceous; front femur black on posterior face, ferruginous on the other two faces; front tibia black on outer face, dark ferruginous on the other two; apical tarsal joints often somewhat ferruginous; spurs yellow.

Pubescence: Black on vertex, and usually more or less black on mesonotum, scutellum and discs of second to fifth segments of abdomen; otherwise white on head, thorax, legs, and on first and sixth abdominal segments; second to fifth segments with entire white apical fasciae, sometimes thin on the more basal segments, the discs with pubescence paling basally, and with small amounts of white tomentum across the base; sixth segment densely covered above with white tomentum and with erect white hairs in addition; front tarsus with a definite though short posterior hair fringe.

Type.—Male; Texas. [A.N.S.P., no. 2442].

Range.—This species is extensively distributed throughout the United States and southern Canada, and is in flight the entire summer. Large numbers of specimens have been found in the various collections which have been studied and complete records have not been kept for all. A partial list of the locality records follows:

California: 1♂, Los Angeles, July 10, 1926, (Hicks). 1♂, Riverside, Sept. 7, 1926, (Timberlake; on *Eriogonum fasciculatum*). 1♀, Yosemite, July 10, 1905, (J. McFarland). 2♀, Yosemite, June 25, 1926, (Timberlake; on *Lupinus longipes*). 1♂, Yarbo Linde (?), Oct. 3, 1926, (Timberlake; on *Merrubium vulgare*). Also identified from Placer County.

Colorado: 3♂, Hubbard Ranch, Elbert, June 9, (Figgins; on *Gilia*). 1♂, Palisades, July 18, 1919. 1♀, Roggen, July 25, 1930, (H. G. Rodeck). Also identified from La Junta and Pagosa Springs.

Connecticut: 1♂, Union, June 25, 1921.

Georgia: 4♀, no locality record, (1♀, labelled *M. generosa* Cress. type.) 1♀, St. Simons, June 2, 1922. 3♂, Thalman, June 3, 1922; (both Mitchell). 7♂, Tifton, May 19 and June 11-17, 1896. Also identified from Roswell.

Illinois: 1♀, no locality record, (labelled *M. mendica*).

MASSACHUSETTS: 4♂, 4♀, Forest Hills, June 30 to Aug. 3, (on *Baptisia, Vicia, Rubus,* and *Asclepias*). 5♂, Needham, June 20 and 24, 1921, (on *Rubus* and *Trifolium*). 2♀, Needham Aug. 7, 1926 and E. Aug., 1933, (on *Baptisia*); all (Mitchell). 2♀, Southbridge, July 19, 1921. 1♂, Southhampton, July 11, 1894. Also identified from Barnstable, Coldbrook, Dover, Eastham, Lexington, Mannomet, Provincetown, Ruthland, Sharon, Swansea, Wellesley, and Wollaston.

MISSOURI: 1♂, Columbia, June 7, 1923, (Bromley).

MONTANA: 1♂, 6♀, no locality record. Identified from Pondera County.

NEBRASKA: 1♂, Louisville, July 31, 1914, (E. G. Anderson; on *Asclepias tuberosa*). 1♂, 1♀, Maskell, Dixon County, July 16 and 20, 1915, (E. G. Anderson; on *Petalostemon candidum*). 1♂, Monroe Canyon, Sioux County, Aug. 3, 1908, (R. W. Dawson; on damp ground). 3♀, Omaha, Aug. 18, 1913 and July 14, 1914, (L. T. Williams; on *Chamaecrista fasciculata*). 1♂, South Bend, June 30, 1915, (E. G. Anderson; on *Melilotus alba*). Also identified from Dundy County, Halsey, Meadow, Mitchell, Nebraska City, and Union.

NEW JERSEY: 1♀, Anglesea, Aug. 8, 1901. 1♂, North Woodbury, June 13, 1901. 3♂, Ocean Grove, July 10 and 19, 1893. 1♂, Westville, June 19, 1892.

NORTH CAROLINA: 2♀, no locality record. 2♂, Aberdeen, June 28, 1930. 1♂, Beaufort, June 9, 1931, (on *Coreopsis,* ?). 2♂, Bogue, Aug. 7, 1930, (on *Clethra*). 1♂, Burgaw, July 18, 1928, (on *Koellia*). 2♀, Carolina Beach, Sept. 11, 1928 and June 12, 1930. 2♂, 7♀, Harker's Island, June 11 and 12, 1931, (on *Crotalaria* and *Opuntia*). 2♀, Harnett County, Sept. 30, 1933. 1♂, 1♀, Kingsboro, June 9, 1932, (on *Trifolium*). 5♀, Lakeview, Sept. 23, 1933, (on blue Gerardia). 1♂, 3♀, Merry Oaks, May 27, 1926, (on *Tephrosia*). 1♂, Overhills, Sept. 13, 1921, (on cultivated *Buddleia*). 1♀, Plymouth-Wenona turnpike, Sept. 21, 1923, (on *Elephantopus carolinianus*). 4♂, 2♀, Raleigh, June 12, 1924, (on *Asclepias*), July 14, 1928, June 5, 1930, (on *Tephrosia*), Aug. 3 and 12, 1932, (on *Strophostyles*). 10♀, Southport, June 23 & 24, 1928, (on *Hypericum*). 1♂, 2♀, Tarheel, July 22, 1928, (on *Galactia*). 18♀, White Lake, July 22, 1928, (on *Galactia*). 4♂, 9♀, Wilmington, July 10 to Sept. 14, (on cultivated beans and *Galactia*); (all Mitchell).

OHIO: 1♂, 1♀, Lake Lab., Cedar Point, July 20 & 24, 1917. Also identified from Hocking County.

PENNSYLVANIA: 1♀, Lehigh Gap, June 26, 1901.

RHODE ISLAND: 1♂, Providence, 7.8, (July ?), (labelled *M. brevis* Say).

TENNESSEE: 1♂, no locality record.

TEXAS: 1♂, Willis, Jan. 1, 1903, (Bridwell). Also identified from El Paso, Fedor, and Ozona.

Additional specimens of *texana* have been identified from the following localities: Alabama—Dothan; Arizona—Catalina Mts., Fort Grant, Oak Creek Canyon; British Columbia—Peachland; District of Columbia;

Florida—Gainsville, Jacksonville, Miami, Royal Palm Park; Illinois—Chicago, McHenry; Iowa; Kansas—Cawker; Manitoba; Mexico; Michigan—Douglass Lake; Minnesota—Pelican Lake, St. Cloud; New Hampshire—Hanover; New Mexico—Cloudcroft and Pecos; New York—Ithaca; North Dakota—Charson, Devil's Lake, Union, Williston; Ontario-Point Pelee; Quebec—Covey Hill, Kazalaba, Ottawa, Toronto; Vermont—Brattleboro and Norwich; Virginia—Falls Church, Great Falls, Norfolk; Wyoming—Rock Springs.

Flower records.—This species visits a wide range of flowers, and the records include various species of *Asclepias, Buddleia, Pentstemon, Polygala, Eriogonum, Hypericum, Rubus,* and numerous composites, legumes, mints, etc.

The males of *texana* and of its racial varieties, descriptions of which follow, are quite variable, and no satisfactory lines of demarkation between them have been found. Moreover, the range in variation in the eastern and western forms is nearly as great as it is between the races. The females are more easily separated, although the characters employed are subject to considerable variation.

Megachile (Litomegachile) texana var. **cleomis** Cockerell

Megachile cleomis (female) Cockerell, Ann. Mag. Nat. Hist., (7), VI, p. 13, 1900. Cockerell, Entomologist, XXXVII, p. 8, 1904. Hicks, Univ. Colo. Stud., (15), III, p. 228, 1926.

Megachile generosa cleomis Cockerell, Ann. Mag. Nat. Hist., (8), XI, p. 535, 1913.

Megachile pruinosa Friese (nec. Perez), Zeit. Hym. Dipt., III, p. 246, 1903.

The male and female originally described as *cleomis* were erroneously correlated, as previously noted (see p. 31). Due to this mistake the differences between this and *texana* were thought to be much greater than they actually are.

Female.—This differs from typical *texana* in having the black pubescence of the dorsum of the thorax somewhat diluted with pale hairs, and the pubescence of the first segment of the abdomen entirely pale pubescent.

Male.—Specimens of this sex which would appear to be correlated with female *cleomis* differ but very slightly from typical *texana,* about the only discernible difference being a slight modification of the apical margins of the abdominal segments, these being less distinctly and less abruptly depressed than in *texana* s. str., and the pubescence of the mesonotum is largely pale, with but few dark hairs among the generally white pubescence.

Type.—Female; Santa Fe, New Mexico. July 6. (Cockerell). [Cockerell, no. 3381].

Range.—This variant is chiefly western in distribution, although occasionally specimens from the more eastern localities are assignable to it. The flight period does not differ materially from that of true *texana*. Locality records are as follows:

California: 1♀, no locality record, (labelled *M. addenda*). 1♀, Los Angeles. 3♀, Yosemite, July 20, 1905, (J. C. McFarland). 1♂, Yosemite Valley, May 8, 1908. Identified also from Jacumba, and Redlands.

Colorado: 1♂, 1♀, Boulder County, June 24, and Aug. 10. 1925, (Hicks). 1♂, Boulder County, Feb. 15, 1926, (Hicks; apparently bred). 1♂, Boulder County, 4 mile Creek, Aug. 15, 1925, (L. O. Jackson; on *Gilia incenspicus*). 1♀, Denver, July 14, 1897, (on garden Hollyhock). 1♂, Hotchkiss, Roger's Mesa, July 13, 1923, (L. O. Jackson; on *Asclepias galioides*). 2♂, Hubbard Ranch, Elbert, June 9, (Figgins; on *Gilia*). Also identified from Colorado Springs, Glenwood Springs, Grand Junction, Jim Creek, La Junta, and Lamar.

Montana: 20♀, no locality record. Identified from Pondera County.

Nebraska: 1♀, Grand Isle, July 5, 1897, (on *Asclepias*). 1♀, Monroe Canyon, Sioux County, Aug. 3, 1908, (R. W. Dawson; on damp ground). Identified also from Bartley, Halsey, Louisville, Omaha, and War Bonnet Canyon.

New Mexico: 1♀, E. Las Vegas, June 26, 1902. Identified also from Las Cruces and Pecos.

North Dakota: 2♂, 1♀, Washburn, July 22 & 23, 1926, (O. A. Stevens; on *Kuhnistera oligophylla* and *Melilotus alba*). Identified also from Fargo.

Oregon: 1♀, no locality record. Identified from the Dalles.

Quebec: 1♀, Lanoraie, Sept. 3, 1925, (J. W. Buckle). Identified also from Fort Coulange and Ottawa.

Additional localities from which specimens of this variety have been determined are as follows: Alberta—Lethbridge and Medicine Hat; Arizona—Cochise County, Fort Grant, Oak Creek Canyon, and Tucson; British Columbia—Okanagan and Summerland; Florida—Gainsville; Indiana; Kansas—Blue Rapids and Whiting; Minnesota—Wahkon; Ontario—Cochrane and Sudbury; Texas—Austin, El Paso, Fort Davis, and Lee County; Utah—Salt Lake; Wyoming—Douglas and New Castle.

Megachile (Litomegachile) texana var. **lippiae** Cockerell

Megachile cleomis var. *lippiae* Cockerell, Ann. Mag. Nat. Hist., (7), vi, p. 15, 1900. Cockerell, Ann. Mag. Nat. Hist., (7), xvi, p. 223, 1905.
Megachile lippiae Cockerell, Ann. Mag. Nat. Hist., (8), xi, p. 536, 1913.
Megachile generosa lippiae Cockerell, Journ. Ec. Ent., vi, p. 425, 1913.

Female.—This differs from the other races of *texana* in that there is less black pubescence on the abdomen, the black hairs

being evident in the dorsal aspect only at the sides of the fifth and sixth segments, whereas in both the other forms it is conspicuous at the sides of the second to the sixth segments.

Male.—No satisfactory means of distinguishing this sex from var. *cleomis* has been discovered.

Type.—Female; La Cueva, Organ Mts., New Mexico, about 5300 ft. (C. H. T. Townsend; at flowers of *Lippia Wrightii*). [Cockerell].

Range.—This is a definitely western variety, as shown by the following records:

ARIZONA: 6♂, 1♀, no locality record. 1♀, Grand Canyon, July 30, 1905, (J. McFarland). 1♂, Mud Springs, Sta. Catalinas, Aug. 19, 1916. 1♂, Sabina Basin, Santa Catalina Mts., July 8-20, 1916. 2♂, near Kits Peak, Baboquivari Mts., Aug. 7-9, 1916. Also identified from Cochise County, Coyote Mts., and Rio Aravaipa.

CALIFORNIA: 1♂, Cuyamacha Lake, San Diego County, July 7-14, 1919, elev. 5000 ft. 1♀, Palm Canyon, Apr. 5, 1925, (Timberlake; on *Hyptis emoryi*). 1♂, Yosemite, July 20, 1905, (J. McFarland). Also identified from Lindsay, San Diego, and Warren.

COLORADO: 1♂, no locality record. 1♂, Boulder, May 23, 1913, (M. D. Ellis; on Privet). 2♀, Regnier, June 6-9, 1919. 1♂, Palisades, July 18, 1919. Also identified from Arabolas, Grand Junction, Jim Creek, La Junta, and Meeker.

NEBRASKA: 2♂, Sioux County. 2♂, Glen, Sioux County, Aug. 8, 1905. Also identified from Monroe Canyon.

NEW MEXICO: 1♂, no locality record. 13♂, 7♀, Alamogordo, April 16 to June 9, 1902. 2♂, 25♀, Highrolls, May 29 to June 14. 1♂, Las Cruces June 16, (Cockerell; on white Aster). 1♂, Las Vegas, July 10, (Cockerell; on white Hollyhock). 1♀, Magdalena Mts., July, 1894, (Snow). 1♂, San Ignacio, June. 2♀, White Oaks, July 31 and Aug. 8, 1902.

TEXAS: 1♂, 1♀, Brewster County, Chisos Mts., June 10-12, 1908, (Mitchell and Cushman). 1♂, El Paso, Sept. 18, 1923. 1♀, El Paso, Apr. 6, 1902. 1♂, Ysleta, April 3, 1902. Identified also from Helotes and Marfa.

Specimens of this variety of *texana* have been identified also from the following localities: Kansas—Douglas County; Montana—Helena; and Utah—Provo.

Subgenus **NEOMEGACHILE** Mitchell

Neomegachile Mitchell, Trans. Am. Ent. Soc., LIX, p. 302, 1934.

Tongue: Second joint of labial palpus very slightly longer than the first, or the two subequal; maxillary palpi only very minutely pubescent at most, the third joint very slender, not much longer than either of the others.

Female.—Mandible 4-dentate, the inner tooth truncate, a cutting edge between the third and fourth teeth and an incomplete one between the

second and third; basal joint of flagellum slightly shorter than the pedicel, the second joint subequal to the pedicel; mid and hind metatarsi considerably shorter and narrower than their tibiae; claws with robust basal setae which are tooth-like in appearance; abdomen rather slender-cordate, the sixth tergum triangular in dorsal aspect, the apex narrowly rounded, giving the abdomen a pointed appearance, this tergum straight in profile, with short erect hairs visible toward the base, but none toward the apex; sixth sternum without a definite bare area, quite densely covered with scopal hairs, and without any evidence of a bare apical lip.

Male.—Mandible 3- or 4-dentate, entirely lacking an inferior projection; basal joint of flagellum subequal to pedicel, the second joint fully twice this length; cheeks simple and unmodified below; front coxal spines reduced to mere dentiform tubercles or entirely lacking; front legs slender, the tarsi unmodified; mid tibia with the usual apical spur; claws without basal teeth; abdomen narrow, slightly tapering posteriorly, sixth tergum with a conspicuous carina which is usually more or less deeply emarginate medially, the apical margin of the segment without evident teeth; seventh tergum transverse, inconspicuous, not protuberant medially.

Male sternites: Fourth sternum exposed; fifth sternum simple, the pre-, meda- and poststernites poorly defined; sixth sternum with poorly defined medasternal areas but with a broad and distinct poststernal lobe.

Genital armature: Stipites abruptly dilated and flattened apically, lobate basally; sagittae relatively simple, exceeding the stipites.

GENOYYPE: *Megachile chichimeca* Cresson. [Orthotype.]

Megachile (Neomegachile) chichimeca Cresson

Megachile chichimeca Cresson, Trans. Am. Ent. Soc., VII, p. 130, 1878. Friese, Das Tierr. Lfg., XXVIII, Apidae 1, p. 257, 1911. Cresson, Mem. Am. Ent. Soc., I, p. 115, 1916.

Megachile disparipennis W. P. Cockerell, Journ. N. Y. Ent. Soc., XXV, p. 192, 1917.

This is very close to *M. stomatura* Cockerell, described from Trinidad. The latter differs in the lack of black pubescence on the clypeus, in the more sparse puncturation over most parts, and in other more minute details.

Female.—Size: Length 10 mm.; breadth of abdomen 3 mm.; anterior wing 7 mm.

Structure: Face about as broad as long; eyes slightly convergent below: clypeal margin with a small median tubercle and with several irregular crenulations on each side; basal joint of flagellum subequal to or very slightly shorter than the pedicel and also the second joint; lateral ocelli slightly nearer edge of vertex than to eyes; vertex very slightly rounded; cheeks narrower than eyes; second and third abdominal terga slightly

depressed across base, apical margins of the second to the fifth slightly depressed laterally but not at all medially, the sixth straight in profile, with numerous short erect hairs visible toward the base in profile.

Puncturation: Minute and crowded on cheeks; deep, close and moderately fine on clypeus, with an indistinct median impunctate line; rather deep, distinctly though not widely separated on vertex and over most of thorax, more coarse on pleura, close on mesonotum laterally; very fine and indistinct on abdomen basally, becoming more coarse and sparse on the shining more apical segments, but very fine and quite close on the sixth.

Color: Black; antennae beneath and tegulae reddish-piceous; wings faintly infuscated or subhyaline basally, more deeply infuscated apically, the nervures ferruginous or piceous; spurs yellowish.

Pubescence: White in large part on head, thorax and legs, but the clypeus, supraclypeal area, vertex, scutellum, and to a less degree the mesonotum with blackish or fuscous pubescence; dense tufts of short whitish pubescence on pronotal tubercles, behind wing bases, and behind the tegulae; very short and inconspicuous over most of the abdomen, more whitish on the first segment, dark at least at certain angles on the second, third and fourth, the fifth with scattered erect pale hairs, the sixth with fine scattered subappressed pruinosity which is mostly pale, but brownish toward the apex, with scattered erect darker hairs over basal half of disc; scopa pale ochraceous, dark at apex of the sixth sternum.

Type.—Female; Mexico. [A.N.S.P., no. 2434].

Range.—This species ranges into Texas, two females in the collection of the National Museum bearing the following data: Point Isabel, Tex. (W. P. Cockerell; fls. yellow composite). One of these is the type of *disparipennis* [U.S.N.M., no. 23133], which becomes therefore a synonym.

Megachile (Neomegachile) aegra Mitchell (Pl. I)

Megachile aegra Mitchell, Trans. Am. Ent. Soc., LVI, p. 283, 1930.

It seems quite probable now that this form is the male of *chichimeca.* The two are very closely related at least, if not actually the same.

Male.—Size: Length 6.5 to 7 mm.; breadth of abdomen 2 to 2.5 mm.; anterior wing 5 to 6 mm.

Structure: Face about as broad as long; eyes converging below; clypeal margin with a small median emargination; mandibles 3-dentate, the second tooth more or less emarginate and thus approaching the 4-dentate condition; antennae simple apically, neither dilated nor flattened; lateral ocelli subequally distant from eyes and edge of vertex; vertex slightly rounded; cheeks narrower than eyes, not carinate; front coxae densely pubescent, with short dentiform spines but lacking red bristles; second and

third segments of abdomen depressed basally, the apical margins of the second to the fifth depressed laterally, but only slightly so medially on the more apical segments; sixth tergum almost vertical in position, the carina prominent, narrowly rounded on each side of the semicircular median emargination; seventh tergum very inconspicuous, transversely carinate.

Sternites: Fifth sternum relatively simple and unmodified, without distinct pre-, meda- and poststernites, the medasternal area made barely evident by the presence of some very fine scattered setae, the apical margin slightly incurved, with a slight amount of pubescence at each extreme side; sixth sternum more highly modified, slightly constricted at either side of middle, the median portion with some extremely fine scattered setae along the apical area, a broad distinct poststernal lobe projecting apically.

Genital armature: Stipites very slender medially, with a distinct basal carinate protuberance, abruptly dilated and flattened apically, with some long hairs on the inner face; the sagittae relatively robust and straight, exceeding the stipites; the volsellae rather robust, apex rounded.

Puncturation: Very fine and close but not crowded on vertex, mesonotum, pleura and on scutellum laterally; minute and densely crowded on scutellum medially and on posterior margin of mesonotum; minute, shallow and rather close on the shining cheeks and abdomen, becoming more coarse and sparse on the more apical segments, the sixth rugoso-punctate.

Color: Black; antennae more piceous; tegulae ferruginous; wings faintly infuscated, rather deeply so in region of radial cell, the nervures piceous; apical tarsal joints becoming more ferruginous; spurs yellowish.

Pubescence: Mostly whitish or pale ochraceous on head, thorax, legs and basal segments of abdomen, short, very thin above, more dense laterally and beneath, with a slight intermixture of inconspicuous dark hairs on vertex, mesonotum and scutellum; dense tufts of short whitish or ochraceous pubescence on pronotal tubercles, behind tegulae and behind wing bases; second to fifth abdominal segments with dark pubescence, very short and obscure on the second, third and fourth, the fifth and sixth with scattered longer black hairs, the first to the fifth with entire whitish or pale ochraceous apical fasciae, these very thin medially on all except the fifth.

Type.—Male; Chapada, Brazil, October. (H. H. Smith). [A. N.S.P., no. 4137].

Range.—The type material includes two topotypical males, one male from Georgetown, British Guiana, (Crew), [Titus], and one male from Los Amatos, Guatemala, (Kellerman), [M.C.Z.]. More recently (J. 27, 1930) a male was captured in Bexar County, Texas (near San Antonio), by Mr. H. B. Parks.

Subgenus **CRESSONIELLA** Mitchell

Cressoniella Mitchell, Trans. Am. Ent. Soc., LIX, p. 302, 1934.

Tongue: Joints one and two of labial palpi subequal; maxillary palpi nearly bare, the third joint small.

Female.—Mandible with three distinct acute apical teeth, the inner angle abruptly and rather broadly truncate, a cutting edge between this truncation and the third tooth, an incomplete one between the second and third teeth; basal joint of flagellum longer than the pedicel, subequal to the second joint; mid and hind metatarsi distinctly shorter and slightly narrower than their tibiae; claws with short and distinct tooth-like basal setae; abdomen cordate; sixth tergum somewhat triangular in dorsal aspect, the apex rounded, straight in profile, with abundant erect hair visible; sixth sternum densely covered with scopal hairs basally, largely bare apically, but entirely lacking a bare apical lip.

Male.—Mandible 4-dentate, entirely lacking an inferior projection; basal joint of flagellum subequal to or slightly longer than the pedicel, the second joint much longer; cheeks simple and unmodified below; front coxae pubescent, lacking both spines and red bristles; front tarsi slender and simple; mid tibia with the usual apical spur; claws entirely lacking basal teeth; fifth segment of abdomen usually tomentose, the sixth densely so, its carina short, deeply emarginate medially and reduced thereby to a pair of narrow acute projections, apical margin of the tergum with teeth very small or absent; seventh tergum transverse, barely evident.

Male sternites: Fourth sternum exposed; lateral portions of fifth presternite broad and extensive, the median portion much reduced, its medasternite relatively broad and short, the poststernal strip barely if at all evident; medasternal areas of sixth sternum small, oblique and densely setose, widely separated, the poststernal lobe very broad and short.

Genital armature: Broad and short, the stipites robust basally, narrowed apically, the sagittae straight and quite robust, slightly exceeding the stipites.

GENOTYPE: *Megachile zapoteka* Cresson. [Orthotype.]

Megachile (Cressoniella) zapoteka Cresson (Pl. I)

Megachile zapoteka Cresson, Trans. Am. Ent. Soc., VII, p. 128, 1878. Friese, Das Tierr. Lfg., XXVIII, Apidae 1, p. 260, 1911. Cresson, Mem. Am. Ent. Soc., I, p. 134, 1916.

Megachile tuxtla Cresson, Trans. Am. Ent. Soc., VII, p. 128, 1878. Friese, Das Tierr. Lfg., XXVIII, Apidae 1, p. 260, 1911. Cockerell, Ann. Mag. Nat. Hist., (8), X, p. 25, 1912. Cresson, Mem. Am. Ent. Soc., I, p. 133, 1916. Cockerell, Proc. U.S. Nat. Mus., LV, p. 214, 1920. Mitchell, Trans. Am. Ent. Soc., LVI, p. 287, 1930.

Female.—Size: Length 11 to 13 mm.; breadth of abdomen 3.5 to 5 mm.; anterior wing 7.5 to 9.5 mm.

Structure: Face slightly broader than long; eyes very slightly convergent below; clypeal margin straight, very finely serrate or crenulate; basal joint of flagellum longer than pedicel, subequal to or very slightly shorter than the second joint; lateral ocelli considerably nearer edge of vertex than to eyes; vertex flat; cheeks slightly narrower than eyes; abdominal segments two to four slightly depressed across base, apical margins of the second to the fifth more or less depressed, more so laterally and on the more apical segments, the sixth somewhat triangular in dorsal aspect, the apex rounded, practically straight in profile, with abundant erect hair visible.

Puncturation: Close and fine on cheeks, face, scutellum and over most of mesonotum, slightly more coarse and distinctly separated on mesonotum medially; fine, deep and quite close on vertex, but rather sparse laterally; moderately coarse and close on clypeus, but slightly separated along the median line; rather coarse and close over most of pleura; very fine and close on abdomen, indistinct basally.

Color: Black; antennae and tegulae piceous or black; wings lightly infuscated basally, more deeply so apically, the nervures deep ferruginous to piceous; spurs yellowish.

Pubescence: Greyish-white on most of head, thorax and legs, but black or fuscous on clypeus and supraclypeal area, with long conspicuous fuscous hairs intermixed with the white on vertex, mesonotum and scutellum, with tufts of long black hairs on prothoracic tubercles and behind wing bases; front metatarsi with purplish-fuscous pubescence anteriorly; first and second abdominal segments with long pale hair basally, but this more or less dark across the apical portions of the discs; third to fifth segments with short black pubescence, but this tending to pale toward the basal margin of each; first to fifth segments with entire ochraceous apical fasciae, thin on the first; sixth tergum with ochraceous tomentum and numerous erect black hairs; scopa ochraceous to pale fulvous, black at least in part on the sixth sternum.

Male.—Size: Length 10 to 12 mm.; breadth of abdomen 3 to 4 mm.; anterior wing 7 to 8 mm.

Structure: Face slightly broader than long; eyes slightly convergent below; clypeal margin slightly incurved over the median third, this area very slightly crenulate or subentire; basal joint of flagellum slightly longer than the pedicel, the second joint much longer, the apical one simple; lateral ocelli nearer edge of vertex than to eyes; vertex flat; cheeks subequal to eyes in width; second to fourth abdominal segments rather deeply depressed basally, the apical margins of the second to the fifth only slightly depressed, more so laterally; carina of sixth tergum with spine-like teeth which are separated by a rather broad emargination, median teeth of the apical margin of the segment barely evident, the lateral ones inevident; seventh tergum barely evident, transverse, not protuberant.

Sternites: Lateral portions of fifth presternite broader than long, with some fine apical pubescence, the median portion short linear, protuberant medially, the medasternite short medially, with a deep rounded median apical emargination, with minute pubescence which is more conspicuous apically, the poststernal strip inconspicuous; lateral portions of sixth presternite rather short and broad, slightly pubescent apically, the medasternal areas somewhat linear or "rolled", oblique, densely covered with short curved setae, the poststernal lobe very broad and short, the latero-apical angles considerably produced.

Genital armature: Stipites constricted just above base, the margin of this constriction produced into a rather prominent carinate angle, flattened and dilated beyond this, but narrowed toward the tip; sagittae slightly exceeding the stipites, somewhat more slender, but the tips somewhat dilated; volsellae triangularly acute.

Puncturation: Very close and fine on cheeks, mesonotum and scutellum, more coarse and distinctly separated on vertex; more coarse but quite close on pleura; very fine and close on abdomen, minute and indistinct basally; anterior faces of front femora and tibiae polished and impunctate.

Color: Black; antennae and tegulae more piceous; wings faintly infuscated or subhyaline basally, more distinctly clouded apically, the nervures piceous; spurs yellow.

Pubescence: Pale ochraceous on face, but more whitish on other parts of head and on thorax, legs and basal segment of abdomen, the vertex, mesonotum and scutellum with much long conspicuous intermixed black pubescence, and clypeus with a few black hairs at each extreme side; rather deep ochraceous or fulvous on second to fourth segments of abdomen, with a slight amount of black intermixed, these with apical ochraceous fasciae which are more or less interrupted on the more basal segments, the third and fourth with ochraceous tomentum across the base; fifth and sixth densely covered with ochraceous tomentum and with long erect black hairs; front metatarsal fringe very thin and entirely pale.

Type.—Female; Mexico. [A.N.S.P., no. 2428].

Range.—This species ranges through Central America north to Arizona, where it occurs in July and August. Records include the following:

Arizona: 1♂, Cave Creek Canyon, Chiricahua Mts., 5500 ft., [U.S.N.M.]. 1♂, Fort Grant, [Salt]. 2♂, 8♀, Palmerlee, Aug., (Banks), [M.C.Z.]. 1♂, Ramsey Canyon, Huachuca Mts., (W. M. Mann), [Mitchell]. 1♀, Reef, (C. R. Biederman), [Titus].

Costa Rica: 2♂, 11♀, San Jose, May 20, 1903, (Crawford), [Titus].

Mexico: 1♂, Atzcapolzalco, Aug., [A.N.S.P.].

Specimens from Costa Rica have a somewhat narrower abdomen than those from Arizona, but no other differences have been detected.

NOTES AND NEW SPECIES OF MICROLEPIDOPTERA

BY ANNETTE F. BRAUN

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PTEROPHORIDAE

Platyptilia auriga Barnes and Lindsey

1921. *Platyptilia auriga* Barnes & Lindsey, Contrib. Nat. Hist. Lep. N. A., IV, p. 330.

The species appears to be rather plentiful throughout the more southern part of the Appalachians, particularly in the Cumberland Mountains and Cumberland Plateau, where it is one of the commoner Pterophorids of open woods. The food plant of my reared specimens is *Gerardia* (*Dasystoma*) *laevigata* Raf. Larvae were found on the lower slopes of Big Black Mountain, Letcher County, Kentucky, May 6, spinning the leaves together and eating into the tips of the growing shoots. The imagoes emerged May 20 and 23. A second generation seems to be indicated by July and August dates among my flown series. In addition to the locality mentioned above, I have specimens from Balsam, North Carolina, Mountain Lake Park, Maryland, Mountain Lake, Virginia, and Powell County, Kentucky.

OECOPHORIDAE

Fabiola tecta new species

Second segment of labial palpi white, third black except at base. Antennae dark brown, with bases of segments and ciliation paler. Face silvery gray; head and thorax dark brown. Fore wings golden yellow, overlaid with brown scales along extreme margins and at base below fold. At basal fourth is a fascia not quite reaching either margin, metallic in its costal half, white and dilated in its dorsal half, the whole edged with black scales; at apical fourth, a triangular white costal spot and opposite it, but nearer base, a similar dorsal spot, both extending out into the cilia, and connected by a metallic blue band, forming an oblique fascia, which is heavily margined inwardly at its extremities, and narrowly on both sides

of the metallic central part with black scales. Between these two fasciae, lies a broad velvety black band, in its broadest middle part broader than the ground color to either side of it; it does not quite reach the costa, and is divided on the fold by a narrow line of ground color. In this black band are three longitudinal metallic blue streaks, one just below costa and easily lost, the second close to it, the third on lower margin of cell, sometimes broken; in the narrow part below fold, a metallic blue spot. Wing margin and cilia beyond the second pale fascia dark brown, with a white patch in the cilia opposite apex. Hind wings and cilia dark bronzy brown, extreme base and costal area for one-half the wing length white. Legs dark brown, barred with white. Abdomen including anal tuft dark brown. Expanse, 9 to 10 mm.

Type.— ♂ ; near Natural Bridge, McCreary County, Kentucky, June 22, 1932.

Paratypes.—1 ♂ , same locality and date as the type; 1 ♀ , Balsam, North Carolina, July 22, 1911.

Type and paratypes in the author's collection.

The Kentucky specimens were found resting on sandstone cliffs in deep sheltered gorges. The habits of this species are identical with those of the type of the genus, *shaleriella* Chambers.[1]

[1] Cin. Quart. Journ. Sci., II, 114, (1875).

F. tecta differs from *F. shaleriella* in the character of the velvety black and metallic markings of the middle of the wing, and the complete and differently placed fascia at three-fourths, and resembles *Schiffermuelleria edithella* Busck in the longitudinal metallic streaks on the disk. This latter resemblance suggests that *Fabiola* should not be retained as distinct from *Schiffermuelleria.*

Yponomeutidae

Zelleria gracilariella Busck

1904. *Zelleria gracilariella* Busck, Proc. U. S. Nat. Mus., XXVII, p. 753.

Larvae webbing leaves of *Ribes* sp. near Newfound Gap, along the crest of the Great Smoky Mountains, Tennessee, at an altitude of about 5500 feet, produced moths identical with those reared on *Ribes* from several western localities. The recording of this western species from the Southern Appalachians is of considerable interest.

Elachistidae

DICRANOCTETES Braun

1918. *Dicranoctetes* Braun, Ent. News, xxix, p. 250. [Genotype, *Dicranoctetes angularis* Braun, Ent. News, xxix, p. 251.]

1934. *Donacivola* Busck, Ent. Amer., xiii, p. 169. [Genotype, *Donacivola saccharella* Busck, Ent. Amer., xiii, p. 169, pl. 32.]

The close structural agreement of *D. angularis* and *D. saccharella,* both in imaginal and early stages, demonstrates the generic identity of the tropical genus *Donacivola* with the Appalachian genus *Dicranoctetes.* The sum total of its characters places *Dicranoctetes* in the Elachistidae. The venation of the two genera is identical; the fore wing cubitus is unbranched. On the basis of Elachistid affinity, the vein reduction has been brought about by the coalescence of Cu_{1a} and M_3, i.e., veins 3 and 4 (cf. Braun, Pupal Tracheation and Imaginal Venation).[2] The other veins are present. M_1 (vein 6) is present in both species, but very short in the smaller *D. angularis,* and was overlooked when the description of *Dicranoctetes* was prepared. A reared female specimen of *Dicranoctetes angularis* was submitted to Mr. Busck, who compared it with his type material of *Donacivola saccharella* and reached the same conclusion. He writes "I have made a slide of the genitalia of this female, which further substantiates the generic identity. . . Specifically also *angularis* is very close to *saccharella,* but aside from the venation difference, the slight difference in coloration, the larger difference in size, and the very different localities would indicate two species. The female genitalia in this group (*Elachista*) are very similar but these also tend to prove the two species distinct; the food plants are less convincing as *saccharella* very likely has another native grass as original food plant."

A slide from the type material of *D. saccharella,* kindly loaned the writer for comparison, indicates the specific distinctness of the two species, which show slight differences in the imaginal coloration and markings. This is borne out by differences in the pupae, described below.

Two female specimens of *Dicranoctetes angularis* were reared from miners of a grass, *Muhlenbergia tenuiflora* Willd., collected

[2] Trans. Am. Ent. Soc., lix, pp. 253-254, (1933).

at Carter Caves, Carter County, Kentucky, October 15, 1932; the imagoes emerged April 11, and May 11, 1933. The mine, which occurs on the stem leaves of the plant, is translucent, with all parenchyma consumed and frass scattered throughout; it starts as a fine linear mine, gradually increasing in breadth, often bent back on itself, occupying finally half or more of the leaf surface. It has in every respect the appearance of a typical *Elachista* mine. No detailed description of the larva was possible under the field conditions of collection, but the general appearance of a dessicated specimen in a dried mine indicates essential agreement with that of *D. saccharella,* as described by Mr. Busck.

The larva pupates in a crevice beneath a thin white silk double cocoon; the inner cocoon consists of two series of parallel silk threads, placed diagonally and crossing each other obliquely; the outer cocoon of a single series of parallel threads at right angles to the longitudinal axis of the pupa.

The pupa of *D. angularis* agrees in general character with that of *D. saccharella,* as figured by Mr. Busck, but differs in details of the spines. Most obvious of these differences is that the posterior fork of the abdominal spines is a mere blunt projection, less than one-fourth the length of the acutely attenuated anterior fork.

Apart from the much smaller size, *D. angularis* differs from *D. saccharella* in the presence of a distinct white streak, instead of a somewhat paler shade on costa bordering the inner side of the black fascia.

Gracilariidae

Lithocolletis rhododrendrella new species

Head and tuft pure white; antennae whitish, tip darkened. Thorax and extreme base of fore wings white. Ground color of the fore wings golden ocherous, with median basal streak, a dorsal spot near base, four costal and three dorsal streaks white. In general the ground color is deeper and the markings more sharply defined in females than in males. The median basal streak extends about one-fourth the wing length, is straight, and margined above, and very rarely at tip with dark brown scales. These scales sometimes extend beyond along the middle of the wing uniting with the dark lower margin of the first costal streak. The dorsal spot near base is variable in size, unmargined, and sometimes narrowly connected with base along the wing margin. Costal and dorsal streaks less oblique than

usual in the genus; the first costal bent below costa, its tip reaching well beyond that of the first dorsal, dark margined inwardly and below; the three following costal streaks are small, curved, and dark margined inwardly. The first dorsal somewhat quadrate, less oblique than the opposite first costal, reaches less than half way across the wing and is dark margined inwardly. The second dorsal, longer than the first and pointed, reaches more than half way across the wing and ends between the second and third costal streaks; its inner dark margin is a little indented on the fold. The third dorsal lies above tornus and opposite the space between the third and fourth costal streaks. A few black scales form an ill-defined apical spot, preceded by a white patch which sometimes encroaches on it. Marginal line of scales darkened at tips around apex. Cilia whitish, shading to ocherous above tornus. Hind wings pale grayish ocherous, cilia more ocherous. Legs white, the anterior tibiae and tarsi only shaded with dark fuscous. Expanse, 11 mm.

Type.—♂; Great Smoky Mountains, Tennessee, imago July 1, 1934; reared from a miner of leaves of *Rhododendron punctatum.*

Paratypes.—25 ♂, 16 ♀ all reared, imagoes June 29 to July 2, 1934, from the same lot of mines.

Type and 32 paratypes in the author's collection; paratypes in the United States National Museum, the Academy of Natural Sciences, and the Canadian National Collection.

The large tentiform mines were first observed by the writer July 20, 1933, at Alum Cave (altitude, 5000 feet) in leaves of the previous year's growth on plants beneath the overhanging cliffs. At this time the moths had all emerged. No mines were seen on the same plant along the summit trails.

In June of the following year (1934), the mines from which the type series was reared were collected at Alum Cave by Mr. Willis King, now with the National Park Service, who found them also on Laurel Top Mountain. Mr. King wrote: "[The mines] are most abundant on southern exposures that are damp, but fairly well protected. The Rhododendron on the ridge tops seems free of them." The species has apparently but one generation a year, the larvae feeding on the tender young growth in late summer, the moths emerging early the next summer. In the mine, the parenchyma is eaten irregularly, leaving small patches around the periphery and a larger area in the middle of the mine uneaten; the loosened lower epidermis is thrown into several long ridges when the leaf is bent. At the time of pupation, one end of the

mine is partitioned off by a very thin silken web and thinly lined with silk; the pupa is merely suspended in a few silken threads, not sufficiently dense to call a cocoon.

The food plant, *Rhododendron punctatum* (*Rhododendron carolinianum* Rehder in the Manual of the Southeastern Flora, Small, 1933) is an endemic of the Southern Appalachians, and the leaf miner on it is probably as circumscribed in range.

Lithocolletis rhododendrella is most closely related to *L. populiella* Chambers in general configuration of wing markings; it differs from it in the entirely white thorax and absence of a costo-basal white streak, and its much larger size, larger than that of the average American species.

Lithocolletis ostensackenella Fitch

1859. *Argyromiges ostensackenella* Fitch; Rept. Ins. N. Y., v, p. 338.
1908. *Lithocolletis ostensackenella* Braun, Trans. Am. Ent. Soc., xxxiv, p. 311. (Rev. N. A. Spec. Lithocolletis.)

A single specimen of this widespread species was reared from a mine of typical appearance on *Robinia neo-mexicana,* Bright Angel Point, North Rim of the Grand Canyon, Arizona. This specimen differs markedly from the typical form, which shows almost no variation in coloration over a wide geographical range. The tuft on vertex is whitish with a faint golden tinge (dark brown in the typical form); the thorax and fore wings are uniformly golden brown, without the usual darkening of the basal fourth of the wing; the wing expanse is 7.5 mm., that of the typical form, 5.5 to 6 mm.

At the same time, specimens of *Lithocolletis robiniella* Clemens were reared from white underside mines on the same food plant. These agree exactly with eastern specimens except for the somewhat greater wing expanse (7 mm.).

The interesting feature is the finding of these two widely distributed eastern species in an area of extreme geographical isolation—the Kaibab Forest on the Kaibab Plateau,—the one species, *robiniella,* showing no modification of typical characters, the other species, *ostensackenella,* while agreeing with the eastern form of the species in larval habits, strikingly different in adult coloration, though obviously conspecific with it.

Parectopa geraniella new species

Palpi dark brown, second segment silvery at apex, third silvery above; head dark brown, a white line on each side above antenna; antennae dark brown, tips silvery. Thorax dark brown. Fore wings golden brown, base especially toward costa usually darker brown and concolorous with thorax. From just beyond base, an opalescent silvery longitudinal streak below fold to one-fourth the wing length, margined with dark brown. Four costal and four dorsal opalescent silvery streaks, margined with dark brown. The costal streaks at two-fifths and three-fifths respectively are of equal size, outwardly oblique and parallel, extending half way across the wing; the two outer ones curved, inwardly convex. The first dorsal streak is outwardly oblique and opposite the space between the first two costal streaks; the second dorsal opposite the space between the second and third costal. Third dorsal curved, usually meeting third costal; fourth dorsal just before apex (sometimes obscure), its inner and darker margin continuous with the outer and darker margin of the fourth costal. A large velvety black spot occupies the apex of the wing beyond the last pair of streaks, leaving only a small wedge of ground color between it and the fourth costal streak. Cilia around apex dark brown, becoming darker below apex and almost black next to the fourth dorsal streak. The opalescent color of the last costal and dorsal streaks extends as a silvery pencil into the cilia. Hind wings and cilia dark purplish brown. Legs dark brown, middle and hind tibiae with silvery bars; tarsal segments silvery tipped. Expanse, 6 to 8.5 mm.

Type.—♂; Bear Creek, Scioto County, Ohio. Imago July 20, 1931; from a miner of leaves of *Geranium maculatum L.*

Paratypes.—1 ♂, 6 ♀, same locality, 1 ♀, Bundle Run, Adams County, Ohio, imagoes July 16 to 24, 1931. 1 ♀, Peabody, Clay County, Kentucky, imago July 19, 1933. All reared.

Type and seven paratypes in the author's collection; one paratype (♀) in the Academy of Natural Sciences; one paratype (♀) in the United States National Museum.

The species is apparently widely distributed through the Allegheny and Cumberland Plateaus, as, in addition to the type localities, mines have been observed in Lewis, Madison and Letcher Counties in Kentucky.

In general the mine may be described as a linear mine, much contorted in the later stages and becoming blotch-like through the confluence of the convolutions. In the early part of the mine no parenchyma is consumed and the mine is difficult to detect; it is more plainly visible on the lower side of the leaf. While still retaining its evidently linear character, the mine becomes

translucent; throughout the entire length the frass is deposited in a broad band. The later translucent but brown blotch mine usually entirely obliterates the earliest part of the mine. The larva leaves the mine by a slit on the underside of the leaf and, in almost every instance, spins its cocoon on the underside of the same leaf within about one-half inch of the exit slit. This is elliptical, smooth and almost flat, with the leaf scarcely noticeably bent. The mines from which the type series was reared were collected July 7 and 8; the finding of deserted mines on May 12 indicates the probability of a spring generation.

This very distinct species is perhaps nearest to *P. plantaginisella* Chambers, but the very different apical markings at once differentiate it from this and all other American species.

Gracilaria invariabilis Braun

1927. *Gracilaria invariabilis* Braun, Can. Ent., LIX, p. 58.

Three specimens (2 ♂, 1 ♀) of this species were reared on a narrow-leaved wild plum (*Prunus angustifolia* Marsh) at higher altitudes along the Indian Gap Road, Great Smoky Mountains, Tennessee. They were not observed on the same species at lower elevations. These agree exactly in coloration, but are a little larger (16.5 to 17.5 mm. expanse) than the type series, reared on *Prunus pennsylvanica* L. in Ontario. A slight variation in larval habits was observed; the Tennessee specimens on leaving the mine made a small cone at the tip of the leaf before constructing the typical large *Gracilaria* cone, whereas the larvae of the Ontario specimens rolled only the one large cone.

NORTH AMERICAN WASPS OF THE GENUS NEOTIPHIA

(HYMENOPTERA: TIPHIIDAE)

BY H. W. ALLEN

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The genus *Neotiphia* was erected by Malloch in 1918 on the species *acuta* Malloch. Until recently this has been the only recognized species of the genus. The writer in a previous paper [1] showed that *Tiphia luteipennis*, described by Cresson in 1865, and *T. sulcata* Roberts, described by Malloch under the preoccupied name of *T. canaliculata*, belong in this genus. Several other species have since been recognized, and are described in this paper.

Most of the species recognized occur in the southwestern part of the United States, and there are other records from Guatemala, Mexico, and South Dakota. None has been seen from outside North America. Very little is known concerning the habits and biology of any of the species of this genus.

In preparing this paper, types and specimens in the United States National Museum [U. S. N. M.], the Academy of Natural Sciences of Philadelphia [A. N. S.], the Museum of Comparative Zoology, Cambridge, Massachusetts [M. C. Z.], and in the collection of the Illinois Natural History Survey [I. N. H. S], were studied.

In the descriptions, the terminology of Allen and Jaynes [2] has been used.

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[1] Trans. Am. Ent. Soc., LX, pp. 296 and 297, (1934).

[2] Proc. U. S. Nat. Mus., LXXVI, art. 17, (1930).

NEOTIPHIA

1918. *Neotiphia* Malloch, Ill. Nat. His. Surv. Bull., XIII, pp. 3 and 9.

Female.—Mouth opening usually wider than long; usually without a polished triangular area beneath base of mandible. Distance from posterior margin of mouth opening to occipital carnia broad. Labium large and elongate; labial and maxillary palpi small, the labial palpi distinctly shorter than exposed portion of labium. Wing with radial cell open; the first abscissa of the radius lacking a long spur extending mediad from the radius and partially dividing the first cubital cell. First recurrent vein bent sharply inward before joining the cubital vein or joining it at a right angle. Hind basitarsus deeply grooved. Hind tibia with the sensorium near its apex, usually sunk in a deep narrow pit. First tergite of abdomen with a prominent transverse carina immediately behind anterior face; without depressed area on the lateral aspect. Other abdominal tergites usually with a transverse impressed line anterior to punctate portion; and with a conspicuous broad polished apical band sharply limited cephalad by a row of coarse setigerous punctures. Sixth sternite of abdomen with a prominent, shagreened, impunctate medial stripe or triangular area.

Male.—Mouth opening at most only slightly wider than long, otherwise as described for female. Wing with radial cell closed, the apical abscissa directed strongly proximad over its whole course toward the costal margin, otherwise as in female. Abdominal tergites as described for the female. Sixth abdominal sternite medially with a broad, shallow, conspicuous impression flanked by carinae.

Neotiphia can be distinguished readily from *Paratiphia,* which, in both sexes, has a long spur on the first abscissa of the radius, extending into and partially dividing the first cubital cell. *Neotiphia* can be separated at once from *Tiphia* by the conspicuous polished apical bands of the abdominal tergites, the prominent shagreened medial stripe of the sixth sternite in the female, and the broad shallow impression in the same location on the male. *Tiphia* possesses none of these characters.

Key to Species of Neotiphia

Females

1. Pygidium punctate on basal three-fourths or more, the punctate portion abruptly elevated above a narrow apical border.....2.
   Pygidium punctate on less than basal two-thirds, the punctate portion not abruptly elevated above the apical impunctate portion.....7.
2. Pygidium masked by a conspicuous tuft of long, coarse, yellowish hairs.....5. *cristata* new species.
   Pygidium with its vestiture sparse and relatively inconspicuous.....3.

3. Tegula without trace of a marginal groove; side of pronotum with a well developed groove across its middle; radius arising far before apex of stigma.....7. *acuta* Malloch.
   Tegula with a groove or incision, at least on its posterior margin.....4.
4. Side of pronotum with no groove across its middle; vertex and front without impunctate interspaces as wide as an ocellus.....5.
   Side of pronotum with a well developed groove across its middle; front with at least several impunctate interspaces as wide as an ocellus....6.
5. First abdominal sternite with a prominent transverse process separating disk and escutcheon; dorsum of pronotum with a conspicuous transverse carina.....11. *novomexicana* new species.
   First abdominal sternite without distinct transverse process separating its disk from the escutheon; dorsum of pronotum without a transverse carina.....12. *luteipennis* Cresson.
6. Tegula posteriorly with a distinct vertical aspect, and with a marginal incision terminating before latero-apical angle; anterior half of disk of first sternite with large contiguous punctures.
   6. *crawfordi* new species.
   Tegula posteriorly without a vertical aspect, and with a marginal groove which is not deeply incised but is continuous about latero-apical angle; first abdominal sternite with its discal punctures small and widely separated.....10. *waltoni* new species.
7. Head from front view with vertical eye diameter scarcely half height of head above antennae; hind tibia with its sensorium broad and only shallowly impressed.....1. *ocellata* new species.
   Head from front view with the vertical eye diameter much more than half height of head above antennae; hind tidia with its sensorium narrow and deeply impressed.....8.
8. Front and vertex with many impunctate interspaces wider than an ocellus.....4. *sulcata* Roberts.
   Front, except a narrow median stripe, with no impunctate interspace as wide as an ocellus.....9.
9. Tegula distinctly longer than broad, without any groove bordering the posterior margin; abdominal tergites fringed with conspicuous orange hairs; pygidium punctate on less than basal half.
   2. *colorata* new species.
   Tegula distinctly broader than long, with a groove about the posterior and lateral margins; abdominal tergites fringed with inconspicuous whitish hairs; pygidium punctate on more than basal half.
   3. *mexicana* new species.

Males

1. Clypeus having a broad convex disk with an arcuate margin, and lacking a prominent median projection or beak.....2.
   Clypeus with its extension produced medially into a small pointed, or larger, beak-like process.....3.

2. Minute punctures over whole of front, dorsal aspect of first abdominal tergite, and punctate portion of pronotum much more numerous than the primary punctures; labium without a deep, narrow, medio-basal groove; tegula as long as wide and without a marginal groove. 14. *robusta* new species.

   Minute punctures on above-mentioned areas not everywhere more numerous than the primary punctures; labium with a deep, narrow, medio-basal groove; tegula wider than long and with a groove continuous about lateral and posterior margins.....4. *sulcata* Roberts.

3. Clypeus produced medially into a prominent, elongate, beak-like extension somewhat resembling the apical fourth of the mandible. 13. *rostrata* new species.

   Clypeus produced medially into a small, acute-angled point in no way resembling the apex of a mandible.....4.

4. Hind basitarsus not usually slender and not flattened; the middle tarsi at most with only a few erect hairs longer than the width of the tarsus.....9. *cockerelli* new species.

   Hind basitarsus extremely slender and flattened; the middle tarsi with a conspicuous fringe of long, erect, wavy, white hairs.....5.

5. Tegula without a marginal groove or incision.....7. *acuta* Malloch.

   Tegula with a deep posterior marginal incision..8. *conspicua* new species.

1. **Neotiphia ocellata** new species

Female.—Head in front view with the vertical diameter of the eyes scarcely half height of head above the antennae. Vertex with round punctures irregularly distributed, with several impunctate interspaces as wide as an ocellus, and with scattered minute punctures. Front even more sparsely punctate than the vertex, with the preocellar region impunctate on a space as wide as the ocellar triangle. Clypeus polished impunctate on more than its apical half; basal carinae indistinct. Dorsum of pronotum with its transverse carina lacking except at the humeral angle, its punctures scarcely contiguous. Hind tibia with its sensorium broad and only shallowly impressed. Tegula slightly longer than broad, moderately reddish translucent. Wings moderately infuscated; stigma extending less than half the distance from the insertion of the radius to the basal vein; radius arising at apex of stigma. Propodeal areola 3 to 4 times as long as the apical width, with convex lateral carinae and arcuate apex. First abdominal sternite without a denticle or carina separating the escutcheon from the disk. Pygidium with the apical two-fifths impunctate, shagreened; punctate portion not concealed by its slender erect hairs. Sixth sternite with the apical three-fifths of the sides of its median impunctate triangle straight and inclined at much more than 45° to the median line. Length, 17 mm.

Type.—Female; Dallas, Texas. May 8, 1908. (C. R. Jones). [U. S. N. M., no. 50751].

Paratype.—Female; labeled "Texas". [U. S. N. M.].

2. **Neotiphia colorata** new species

Female.—Vertex and front with no impunctate interspaces as wide as an ocellus except for a narrow median frontal stripe. Clypeus with its basal carina interrupted medially; apex impunctate two-fifths distance to antennae. Dorsum of pronotum without transverse carina, punctures of uniform first-degree density; side of pronotum with prominent rugae on ventral half. Mesepisternum with an angle on anterior margin, though scarcely carinate. Sensorium of hind tibia deep and narrow. Tegula longer than broad, shagreened, piceous; with irregular marginal pits but without a continuous marginal groove. Wing strongly infuscated; stigma small, extending less than half way from radius to basal vein; radius arising near apex of stigma. Propodeal areola with its sides concave and strongly converging apically. Side of propodeum with the rugae confined to dorsal portion, ventral half sharply defined from rugose portion, unsculptured, polished. First sternite of abdomen without carina or ventrally projecting process separating apex of escutcheon from disk of sternite. Pygidium punctate on basal third; apical two-thirds impunctate, unwrinkled, not depressed, completely and conspicuously shagreened. Sixth sternite with the sides of its medial impunctate stripe evenly convergent apically at an angle to the median line much greater than 45°. Apices of abdominal segments, punctate portion of pygidium, the outside surface of the tibia, and basitarsus of the middle and hind pairs of legs with conspicuous orange hairs. Length, 10 mm.

Type.—Female; Antiqua, Guatemala. Feb. 14, 1931. (D. M. Bates). [U. S. N. M., no. 50752].

3. **Neotiphia mexicana** new species

Female.—Vertex with one small impunctate spot wider than an ocellus near each eye. Front nowhere, except on elongate medial stripe, with impunctate interspaces as wide as an ocellus. Clypeus with its basal carina obscure, and interrupted medially; apex impunctate scarcely one-fourth distance to base of antennae. Dorsum of pronotum with complete transverse carina, and moderate-sized punctures which are contiguous on anterior disk; side of pronotum aciculate without any sculpturing of high relief. Sensorium of hind tibia a deep elongate groove broader at apical end. Tegula thick and black, broader than long, with a groove continuous about the lateral and posterior margins. Wing moderately infuscated; stigma extending half way from radius to basal vein; radius arising slightly beyond middle of stigma. Propodeal areola with concave sides strongly convergent to truncate apex; two and one-half times apical width; almost devoid of median carina. First sternite of abdomen with escutcheon terminating in a low, ventrally directed, carinate projection; flat portion of disk with fine, deep primary punctures. Pygidium punctate on basal three-fifths, with inconspicuous vestiture; the impunctate apex not abruptly depressed, wringled, shagreened. Sixth sternite with the straight sides of its medial

impunctate stripe convergent, from near base of sternite, at an angle of nearly 45° to the median line. Length, 10 mm.

Type.—Female; Tuxpan, Jalisco, Mexico. Sept. 4. (McClendon). [A. N. S., no. 4168].

4. **Neotiphia sulcata** (Roberts)

1918. *Tiphia canaliculata* Malloch, Ill. Nat. Hist. Surv. Bul., XIII, p. 10. (Not *canaliculata* Cameron.)

1930. *Tiphia sulcata* Roberts, Can. Ent., LXII, p. 190. (New name for *canaliculata* Malloch.)

1934. *Neotiphia sulcata* Allen, Trans. Am. Ent. Soc., XL, p. 297. (Generic change.)

Male.—Clypeus with arcuate margin not produced medially into a point or beak, differing conspicuously in this respect from the male of other species I have seen except *robusta.* From the latter species it is distinguished by the following characters: Vertex and upper half of front with only scattered minute punctures. Joints of flagellum not swollen on under side. Minute punctures of pronotum scarcely as numerous as the primary punctures; side of pronotum with anterior carina produced into a rather prominent, massive process; disk more or less polished, with weak rugae ventrally and no groove across the middle. Mesepisternum with minute punctures on disk at most scarcely as numerous as the primaries; prepectal carina present though short on some specimens. Tegula black, thickened to apex, wider than long; with marginal groove continuous about the outer posterior angle. Wings hyaline. Dorsum of propodeum with transverse carina high; areola with straight sides strongly tapering to truncate apex; more than twice as long as apical width. Depressed median stripe of sixth sternite not carinate basally and with only a single row of punctures between the impunctate middle and the lateral carina. Body slender. Length, 8 to 9 mm.

Female.—Head sparsely beset with irregularly distributed punctures, with numerous impunctate interspaces wider than an ocellus on anterior half of front, and on vertex. Clypeus impunctate on apical fourth; with transverse basal carina complete though broadly rounded across disk. Dorsum of pronotum with punctures of first-degree density on about half of the punctate area; side of pronotum with many straight rugae on ventral half. Mesepisternum with the largest punctures of the disk usually separated by interspaces wider than their diameters. Sensorium of hind tibia deep and narrowly triangular. Tegula distinctly broader than long, opaque, and conspicuously thickened to apex; with a groove continuous about the lateral and posterior margins. Wings hyaline; stigma extending at least half the distance from base of radius to basal vein; radius arising far before apex of stigma. Propodeal areola three to three and one-half times as long as its apical width; its lateral carinae strongly convergent toward apex. First sternite of abdomen with its escutcheon limited posteriorly by

a low carina; disk broadly beset with small, deep, round, primary punctures. Pygidium rugosely punctate on basal half, with inconspicuous vestiture; apical half wrinkled, shagreened and thickened, except the abruptly depressed, narrow, almost membraneous apical border. Sixth sternite with the straight sides of its impunctate stripe almost parallel. Length, 11 to 12 mm.

Type.—Male; Chimney Gulch, Colorado. [M. C. Z., no. 10253].

Remarks.—This species appears to have been described originally from the single male designated above, which is the basis of the foregoing redescription. The description of the female is based on one of a pair [A. N. S.] mounted on one pin, collected while mating, Pecos, New Mexico. Other specimens examined are as follows: 8 males, Guadalajara, Jalisco, Mexico, Sept. 14 and 18, (McClendon) and one small female, Elmira, South Dakota, (W. J. Fox), [A. N. S.]; in which the distance from the transverse groove of the third abdominal tergite to the apex of the punctate portion is scarcely wider than the impunctate apical band. 1 female, Logan County, Colorado, Sept. 2, 1923, (G. Sandhouse) and 3 females, Colorado, (C. F. Baker), [U. S. N. M.]; which lack a transverse carina on the dorsum of the pronotum but are typical in other respects.

5. **Neotiphia cristata** new species

Female.—Vertex and front densely beset with very coarse deep punctures with no interspaces as wide as ocellus. Clypeus broadly arcuate, shorter than diameter of antennal fossa, very narrowly impunctate at apex; basal carina only narrowly interrupted medially. Dorsum of pronotum scarcely three times as wide as medial length, with an interrupted transverse carina, densely beset with coarse deep punctures separated by interspaces everywhere much narrower than the diameter of the punctures; side of pronotum shagreened with obscure scattered rugulae and punctures. Mesepisternum with a weak vertical carina anteriorly. Sensorium of hind tibia a deep elliptical groove. Tegula faintly shagreened, broader than long and conspicuously thickened to apex. Wings subhayline; stigma minute with the radius inserted at its apex. Propodeal areola slightly tapering caudad, with straight sides and broad truncate apex, which is about one-half the length. Side of propodeum on its upper portion with many close sinuous rugae which merge without sharp definition into the finely wrinkled lower portion. First sternite of abdomen with escutcheon terminating posteriorly in a prominent vertically directed spine. Tergites with very coarse deep punctures everywhere separated by much less than their diameters.

Pygidium with the apical fourth abruptly depressed, impunctate, densely shagreened, thin and foliate; upper punctate portion concealed beneath dense tuft of coarse wavy yellow hairs. Sixth sternite with the sides of its median impunctate triangle inclined at about 45° to the median line. Length, 10 to 11 mm.

Type.—Female; Stone Cabin Canyon, Santa Rita Mountains, Arizona. Aug. 26, 1913. (A. W. Morrill; on *Thurberia thespesioides*). [U. S. N. M., no. 50753].

Paratype.—One female collected with the type.

6. **Neotiphia crawfordi** new species

Female.—Vertex without a distinct impunctate stripe near inner eye margin. Front on upper half with very coarse, round punctures of second-degree density except on broadly impunctate preocellar region. Clypeus impunctate on apical two-fifths; with basal carina complete, though low and rounded medially. Dorsum of pronotum with its transverse carina complete, with very large, round punctures principally of second-degree density, minute or secondary punctures almost lacking; side of pronotum coarsely punctate dorsally, with short rugae ventrally, the middle traversed by a conspicuous groove. Mesepisternum without anterior vertical carina; with very coarse, contiguous punctures. Sensorium of hind tibia an elongate, minute pit. Tegula wider than long, conspicuously thickened at apex, with a deep incision on posterior margin. Wings strongly infuscated; radius arising far before apex of stigma. Propodeal areola with hastate outline, about two and one-fourth times as long as apical width, lacking median carina. Side of propodeum uniformly rugose. First sternite of abdomen with escutcheon terminating apically in a moderately-inclined, acute-angled point; disk elevated, with many deep, coarse punctures anteriorly. Pygidium completely coarsely punctate except for a narrow, abruptly depressed apical border; punctate portion with inconspicuous vestiture. Sixth sternite with its impunctate median stripe widest at the anterior end of the apical third. Length, 13 mm.

Type.—Female; Barstow, Tex. October 12. (J. C. Crawford). [U. S. N. M., no. 50754].

7. **Neotiphia acuta** Malloch

1918. *Neotiphia acuta* Malloch, Ill. Nat. Hist. Surv. Bul., XIII, p. 9.
1927. *Neotiphia acuta* Frison, Ill. Nat. Hist. Surv. Bul., XVI, p. 229.

Male.—In this sex *acuta* differs from all species I have seen except *cockerelli* and *conspicua* in the shape of the clypeus, the punctate portion of the disk of which is extended medially in a small, sharp point. It can readily be distinguished from *cockerelli* by the tarsi of the second and third pairs of legs, which have very thin, inflated, terminal joints and long, dense, wavy hairs on the flexor surface. It is closely related to *conspicua,* but can be separated from that species by the tegula, which lacks a

marginal groove or incision, and the areola, in which the median carina is nearly complete.

Female.—In this sex the species closely resembles *crawfordi,* differing from it in having somewhat finer punctation of head and pronotum, and in having no groove or incision on the posterior margin of the tegula.

Type.—Male; Texas. [I. N. H. S.]. (Designated by Frison, 1927.)

Allotype.—Female; Texas. [I. N. H. S.]. (Designated by Frison, 1927.)

Paratypes.—Two males, Texas. [I. N. H. S.].

Remarks.—The writer has examined the type series in the Illinois collection. Only one other specimen, a female from Beeville, Texas, October 22, [U. S. N. M.], has been seen.

8. **Neotiphia conspicua** new species

Male.—Vestiture conspicuous; lateral and posterior borders of mouth opening with dense fringe of long, wavy, white hairs; punctate portion of pronotum and upper portions of prepectus and mesepisternum, outer portion of apex of femur, and tibia and tarsi of the middle pair of legs with long, erect, wavy, white hairs. Vertex and upper half of front with punctures largely of third-degree density though with scarcely any interspaces as wide as an ocellus; devoid of minute punctures. Clypeus black, broadly and prominently convex; though the basal carina is obsolete, the lateral margins are abruptly depressed, except for a narrowly pointed median portion which is the most conspicuous feature of the clypeus. Dorsum of pronotum without minute punctures, its primary punctures medially of first-degree, laterally of third-degree density; side of pronotum slightly concave, with short ventral rugulae continuous with a shallow crenulate groove across the middle; densely though shallowly punctate on dorsal portion. Mesepisternum with minute punctures much less numerous than the primary punctures. Last joint of tarsus of second and third pairs of legs thin and inflated, more or less ovoid; hind basitarsus flattened and unusually slender. Tegula broader than long, conspicuously thickened apically, with a deep incision anterior to the apical upfolded portion. Wings conspicuously infuscated. Propodeal areola strongly convergent to truncate apex, about two and one-half times as long as apical width, medial carina lacking. Side of propodeum with rugae weak, and completely lacking on a broad polished ventral portion. First abdominal tergite with coarse primary and without minute punctures. First sternite of abdomen with a thin, high medial carina, from which the disk extends in one posterior and two lateral slopes, all three of about equal size. Medial depression of sixth sternite scarcely impressed; the lateral carinae low and rounded, confined to apical half; medial impunctate stripe present on apical three-fourths, separated from the lateral carina by a single row of punctures. Body slender. Length, 10.5 mm.

Type.—Male; Barstow, Tex. October 12. (J. C. Crawford). [U. S. N. M., no. 50755].

Remarks.—This may be conspecific with *crawfordi,* described from a single female collected at the same time and place.

9. **Neotiphia cockerelli** new species

Male.—Vertex and upper half of front with small punctures, largely of third-degree density though with scarcely any interspaces as wide as an ocellus; devoid of minute punctures. Clypeus partially ferruginous, with the median extension strongly convex, and punctate to apex; the basal carina strongly developed, transverse to near medial line, and from there directed abruptly forward to a small point conspicuously elevated above the lateral portions of the clypeal extension. Dorsum of pronotum with small punctures of sparse third-degree density and no interspersed minute punctures; side of pronotum flat and devoid of sculpturing except for scattered punctures over dorsal half. Mesepisternum with only a few scattered, minute punctures. Legs at most with only a few long, erect hairs; terminal tarsal joints not thin or ovoid; hind basitarsus of usual degree of slenderness and not flattened. Tegula piceous, broader than long, its posterior edge thickened and bearing a prominent marginal groove. Wing conspicuously infuscated. First tergite of abdomen with its dorsal aspect almost devoid of minute punctures. First sternite with the escutcheon small, narrow, its slenderly pointed apex merging with a sharp, high median carina extending two-thirds the length of disk. Median depression of sixth sternite with high lateral carinae on posterior two-thirds; median impunctate stripe scarcely carinate, not extending basally beyond lateral carinae, separated from latter by a single row of punctures. Body slender. Length, 9.5 mm.

Type.—Male; Las Cruces, New Mexico. (Cockerell). [U. S. N. M., no. 50756].

10. **Neotiphia waltoni** new species

Female.—Vertex with only one or two impunctate interspaces as wide as an ocellus. Front on upper half with several impunctate interspaces wider than ocellus, the preocellar region broadly impunctate. Clypeus impunctate on apical two-fifths, with basal carina complete though low and rounded medially. Dorsum of pronotum with its transverse carina high and complete, punctures conspicuously large and (except for concentrations at apex of punctate portion) separated by interspaces averaging more than the diameters of the punctures; side of pronotum flat and smooth except for small ventral rugate area, a broad crenulate groove across the middle, and a few deep punctures on anterior border. Mesepisternum without anterior vertical carina, punctures conspicuously large. Sensorium of hind tibia a deep, minute pit. Tegula piceous, broader than long, with a fine groove continuous about the lateral and posterior margins. Wings slightly infuscated; stigma extending about half way from radius to basal vein;

radius arising one-third distance from apex of stigma. Propodeal areola with nearly straight sides, converging to truncate apex; about two and one-half times as long as apical width. First sternite of abdomen with the escutcheon limited posteriorly by an inclined, transversely carinate process; disk more or less uniformly beset with small, deep, primary punctures. Pygidium completely and coarsely coriaceous punctate, except a narrow, abruptly depressed apical border; vestiture of punctate portion inconspicuous. Sixth sternite with its median impunctate stripe broad, with parallel sides to near apex, thence abruptly convergent. Length, 10 to 11 mm.

Type.—Female; Koehler, New Mexico. August 12, 1914. (W. R. Walton). [U. S. N. M., no. 50757].

Paratype.—One female, Colorado. (C. F. Baker). [U. S. N. M.].

11. **Neotiphia novomexicana** new species

Female.—Vertex and front densely punctate, with no impunctate interspaces as wide as an ocellus. Clypeus punctate to apex, with its basal carina complete though low and vague medially. Dorsum of pronotum with its transverse carina complete except for narrow medial gap, its punctures conspicuously enlarged; side of pronotum with ventral rugae grading medially into aciculations. Mesepisternum with conspicuously large, dense punctures. Hind tibia with its sensorium minute and deeply impressed. Tegula broader than long, thickened to apex, with an unbroken groove about the lateral and posterior margins. Wings moderately infuscated; stigma extending less than half the distance from radius to basal vein; radius arising near apex of stigma. Propodeal areola hastate, somewhat more than 3 times as long as its constricted apex. First abdominal sternite with its escutcheon terminating in a conspicuous ventrally directed point; disk broadly beset with fine, shallow primary punctures. Pygidium coarsely coriaceous punctate, except on a narrow, abruptly depressed, inconspicuous apical border; vestiture of punctate portion inconspicuous. Sixth sternite with its broad medial shagreened stripe on apical half convergent at much more than 45° to the median line. Length, 14 mm.

Type.—Female; Organ Mountains, LaCueva, New Mexico. (C. H. Townsend; about 5,300 feet). [U. S. N. M., no. 50758].

12. **Neotiphia luteipennis** (Cresson)

1865. *Tiphia luteipennis* Cresson, Proc. Ent. Soc. Phila., IV, p. 445.
1918. *Tiphia luteipennis* Malloch, Ill. Nat. Hist. Surv. Bul., XIII, p. 10.
1934. *Neotiphia luteipennis* Allen, Trans. Am. Ent. Soc., LX, p. 296. (Generic change.)

Female.—Vertex and front coarsely punctate with no impunctate interspaces as wide as an ocellus except on wide median frontal stripe. Dorsum of pronotum without transverse carina, with coarse punctures largely of

first-degree density; side of pronotum strongly rugoso-aciculate ventrally, with numerous deep punctures above, and without trace of groove across the middle. Tegula opaque black; with a fine groove on lateral margin separated at the latero-posterior angle from a coarser one on posterior margin. Wings strongly infuscated. Propodeal areola with straight sides strongly convergent to the open apex; median carina wide and nearly complete. Side of propodeum completely rugate. First tergite of abdomen with punctures on dorsal aspect arranged in transverse rows. First sternite without an anterior denticle separating escutcheon from disk. Pygidium punctate except for narrow apical border which is abruptly depressed. Length, 12 mm.

Type.—Female; Colorado. [A. N. S., no. 580].

Remarks.—Redescribed from the type. No other specimens have been seen.

13. **Neotiphia rostrata** new species

Male.—Vertex and front with no impunctate interspaces as wide as an ocellus except one or two in preocellar region. Clypeus with its median extension produced into a broadly-pointed, prominently-projecting beak somewhat resembling the tip of the mandible. Carina posterior to mouth opening produced on each side into conspicuous denticles. Dorsum of pronotum with moderate-sized punctures, uniformly distributed, with interspaces averaging more than the average diameter of the punctures; minute punctures absent; with white appressed hairs; side of pronotum polished and unsculptured except for a few obscure punctures anteriorly. Mesepisternum with coarse, contiguous, primary punctures, and interspersed minute punctures which are everywhere more numerous than the primary punctures. Tegula opaque black, thickened, much wider than long, with a groove about the lateral and posterior margins. Propodeal areola rectangular, two and one-fourth times as long as wide. Escutcheon of first abdominal sternite ending posteriorly in an elongate, ventrally directed, carinate point. The median depression of the sixth sternite with lateral carinae and a sharp median carina extending to base of sternite, the depression posteriorly with a dense tuft of short white pile. Body moderately robust. Length, 8.5 mm.

Type.—Male; Arizona. [A. N. S., no. 4169].

Remarks.—Only the single type specimen has been seen.

14. **Neotiphia robusta** new species

Male.—Vertex and front with no impunctate interspaces as wide as an ocellus except one small spot anterior to front ocellus; punctures of first-degree density, the whole front interspersed with many minute punctures. Joints of flagellum swollen on under side. Clypeus black, broadly arcuate, without a medial beak-like extension or acute point, impunctate on apical fourth. Labium without a deep, narrow medio-basal groove. Dorsum of pronotum with many fine, erect, white hairs; punctures of uniform first-

degree density on antero-medial disk, the interspaces everywhere densely beset with minute punctures; side of pronotum concave; broadly rugose ventrally, and punctate on dorsal third, with a perceptible groove across the middle. Mesepisternum with its secondary punctures minute and intergrading with, and everywhere more numerous than, the primary punctures. Tegula piceous, as long as broad, without thickened edges or trace of marginal grooves. Wings moderately infuscated. Dorsum of propodeum without posterior transverse carina, the posterior portion deeply and irregularly pitted; areola scarcely as long as greatest width, with sides converging to apex, which is not clearly defined. Side of propodeum with close parallel rugae above, merging into a coriaceous ventral portion. First abdominal tergite with its whole dorsal aspect densely beset with minute punctures. First sternite with its escutcheon well defined though with margins which are scarcely carinate, the apex broad and scarcely elevated; disk with an anterior carina, its sides with sparse, round, primary punctures. Medial depression of sixth sternite with its side carinate on apical third of sternite; the middle narrowly impunctate to base and finely carinate on anterior half or more, the space between the median stripe and the lateral carina densely punctate, the punctures not in a linear series. Body robust. Length, 13 mm.

Type.—Male; Texas. [U. S. N. M., no. 50759].

STUDIES IN THE LONGICORNIA OF MEXICO

(COLEOPTERA: CERAMBYCIDAE)

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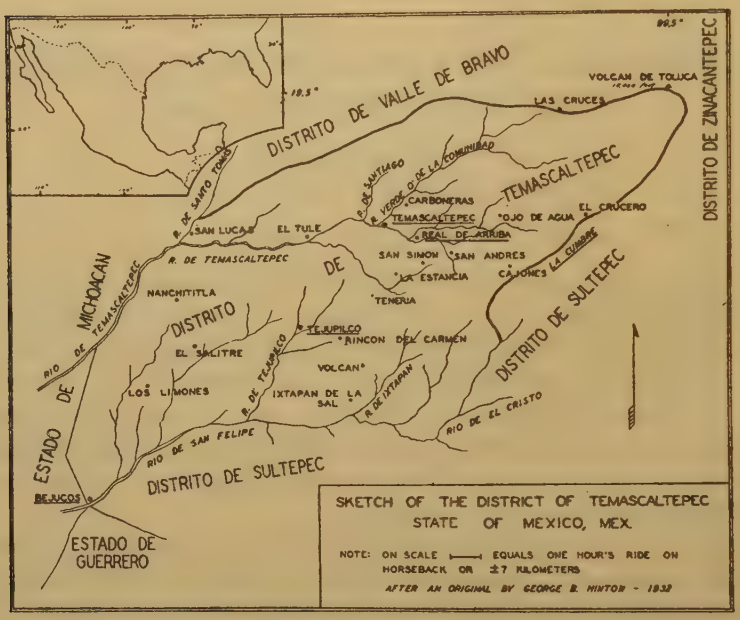
(Plate II and text figure)

The present paper is the first of a proposed series of articles dealing with the longicorn Coleoptera of Mexico. It is based primarily upon a collection of nearly two hundred species of this family taken in the District of Temascaltepec by Mr. Howard E. Hinton and Mr. Robert L. Usinger. The collection was made during the summers of 1932–1933 and is particularly interesting because it represents the fauna of a limited area in a region not hitherto explored entomologically.

The District of Temascaltepec is in the southwestern portion of the State of Mexico, where it slopes toward the Pacific Ocean. Here Messrs. Hinton and Usinger collected in four localities, all within a radius of twenty or thirty miles, but representing several distinct faunal zones. The first of these, Real de Arriba, is a mountainous area (6000-9000 ft. alt.) with various species of oak and baccharis on the more exposed slopes, an introduced species of alder, *Alnus accuminata* along the streams, and the shrub-like *Ternostroemia pringeli* as well as numerous conifers (*Thuja, Pinus,* etc.) in the higher elevations. Temascaltepec (5687 ft. alt.) is a warmer and somewhat flatter country, with alder, a species of *Inga,* and occasional willows along the streams and Temascaltepec River, and scattered broad-leaved trees in the open spaces. Tejupilco (3000-4000 ft. alt.) is subtropical, with *Prosopis, Acacia,* and related thorny leguminous trees in predominance, but with several species of *Opuntia* and *Asclepias* also in evidence. The last locality, Bejucos, is distinctly tropical,

and is located in a low (1982 ft. alt.), humid spot on the San Felipe River, where *Spondias* is conspicuous among the numerous flowering trees.



In the following pages a number of genera and species from the above localities are described as new or recorded from Mexico for the first time. To these have been added a few related species from other regions that seemed best made known in this paper. The writer wishes to express his appreciation to Dr. E. C. Van Dyke and Mr. K. G. Blair for notes and comparisons with types in the British Museum of Natural History, and to Mr. W. S. Fisher for comparing certain species with material in the United States National Museum Collection.

Specimens, including paratypes, of many species here treated are deposited in the collection of The American Entomological Society.

The types of the new species are in the collection of the California Academy of Sciences [C.A.S.]; the numbered types on permanent deposit, the unnumbered types on loan deposit.

Prioninae

(1) **Parandra polita** Say

Several examples of this rather widespread species were taken at light at Temescaltepec in July, (Hinton).

(2) **Aplagiognathus spinosus** Newman

A small series of specimens collected at Temascaltepec, in July, under loose bark of *Salix,* (Hinton and Usinger). One example differs from the rest in having horizontal mandibles and may prove to be another species.

(3) **Stenodontes (Mallodon) molarius** Bates

Taken rather commonly at Temascaltepec throughout July, (Hinton) and at Tejupilco in June and July, (Hinton and Usinger).

(4) **Stenodontes (Nothopleurus) lobigenis** Bates

A single female, found at Tejupilco, July, (Hinton and Usinger).

(5) **Derobrachus sulcicornis** Le Conte

One specimen captured at Real de Arriba under loose bark of *Pinus pseudostrobus,* and one at Bejucos, at light, (Hinton and Usinger). The two examples are both males and differ somewhat in punctation and proportions of elytra.

(6) **Prionus hintoni** new species

This species differs from other known Mexican *Prionus* in the very short antennae of the male, which attain only the basal third of the elytra. In addition, it differs from all except *P. florhi* Bates in having only thirteen segments to the antennae. From *P. californicus* Mots. which it resembles in form, it may be distinguished by the roughened, coriaceous elytra.

Stout, parallel, convex, reddish-brown. Head narrow, coarsely, densely punctured; antennae (♂), thirteen-segmented, very short, attaining basal third of elytra, segments four to twelve gradually diminishing in size and length toward apex, ultimate segment subequal to twelfth. Prothorax short, two and one-half times as broad as long; lateral spines at base and apex short, median spine long, slender; punctation fine, sparse. Elytra not quite twice as long as broad, rugulose, feebly bicostulate; sutural spine prolonged at apex. Legs reddish-brown. Body beneath densely clothed with yellowish hairs; abdomen smooth, shining, almost devoid of pubescence. Length, 42 mm.; breadth 16 mm.

Holotype.—Male; Temascaltepec, July 1931, (H. E. Hinton).

(7) **Trichoderes pini** Chevrolat

A fine series of this high altitude longicorn was taken at Real de Arriba in June, on *Pinus pseudostrobus*. The species resembles *Tragosoma harrisi* LeConte, but differs in the laterally bispinose prothorax, the long palpi and first segment of the posterior tarsus, and in the outer segments of the antennae only, being carinate.

Trichoderes rugosus Bates

I have recently had the opportunity of studying a specimen from Chicavac, Chimaltenango Province, Guatemala, 8600 ft. alt., collected by Mr. J. R. Slevin [C.A.S.], that agrees well with Bates' description of *rugosus*. Judging from this example, the form is not, as proposed by Lameere, a variety of *T. pini* Chev. The two differ as follows:

Reddish-brown, prothorax and scutellum clothed with long yellow hairs; elytra coarsely, cribrately punctured; elytral apices rotundate-truncate, not spinose. Guatemala.....*rugosus* Bates

Yellowish-testaceous, prothorax and scutellum clothed with grayish hairs; elytra less coarsely punctured; apices spinose. Mexico.....*pini* Chev.

Cerambycinae

(8) **Distenia fimbriata** Lacordaire

Several specimens taken at Temascaltepec, (Hinton), and Real de Arriba, (Hinton and Usinger), in July.

(9) **Distenia hogei** Bates

A single example, representing one of the numerous varieties or phases of this species was collected at Tejupilco, June, (Hinton and Usinger).

(10) **Distenia lineatopora irregularis** new subspecies

This subspecies differs from typical *lineatopora* (Guatemala) in that the punctures of the elytra are very irregular, not in four longitudinal rows, and the femora black, with the base yellowish-testaceous.

Elongate, slender, piceous-black, rather sparsely clothed with short, recumbent pubescence, intermixed with scattered, longer, suberect hairs.

Antennae pale brownish, segments three to eleven annulated at apex with piceous. Elytra brownish with a piceous fascia in circumscutellar area, an oblique fascia in ante-median area, and an irregular fascia just before apex; punctation coarse, not linear; apices rounded. Femora black, base testaceous; tibiae pale, base and apex piceous; tarsi testaceous. Length 11.5 mm.; breadth, 2.5 mm.

Holotype.—Male and several *paratypes;* Real de Arriba, July, (Hinton and Usinger; taken at light).

(11) **Spondylus mexicanus** Bates

Two specimens taken under stones and debris at Real de Arriba, June, (Hinton and Usinger). This species is stouter than *S. upiformis* Mann., and is easily recognizable by the four prominent, longitudinal costae of the elytra.

(12) **Tetropium pilosicorne** new species

Related to *T. guatemalanum* Bates, but differing in the smoother, shorter elytra, which are only slightly more than twice as long as broad as compared with more than three times as long as broad in the Guatemalan species. The writer is indebted to Mr. K. G. Blair for comparing this species with the type of *T. guatemalanum.*

Black, shining, clothed with fine, short, black pubescence, with longer erect and suberect hairs on head, antennae, prothorax and body. Head narrow, rather coarsely, moderately densely punctured, shining; antennae short, attaining the middle of the elytra, stout, densely ciliate on all sides with black flying hairs. Prothorax about as long as broad; sides evenly rounded, unequally and not densely punctured; basal constriction obvious. Elytra short, slightly more than twice as long as broad; opaque; discal costae evident; pubescence fine, short, appressed; punctation fine, subgranulose; apices rotundate-truncate. Femora stout. Body beneath finely punctured, clothed with short recumbent hairs. Length, 12 mm.; breadth, 3 mm.

Holotype.—Male (?), and *paratype,* female (?); Tejupilco, May 1933, (Hinton and Usinger; on a fallen log of *Pinus pseudostrobus*).

I have somewhat doubtfully associated with the type a second specimen, taken at the same time and place, but differing in having a broader head and prothorax, stouter and longer antennae, more slender femora, and the legs and base of elytra brownish-testaceous rather than uniformly black. When com-

pared with other species in the genus, this example would appear to be a female, yet the longer, heavier antennae are male characters. Until more material is available for study, the exact status of this form cannot be definitely settled.

(13) **Criocephalus obsoletus** Randall

A single specimen taken at light, Real de Arriba, in June, and another at Tejupilco on *Pinus pseudostrobus,* (Hinton and Usinger).

(14) **Methia bicolor** new species

This species is most nearly related to *M. constricticollis* Schaeffer from Texas, but may be readily distinguished from that species by the elongated elytra which are as long as or longer than the body. This and the following species are remarkable for being the first recorded members of the genus from Mexico, although one each is known from Brazil and Argentina.

Elongate, parallel-sided, testaceous, with eyes, antennae, and elytra piceous black; pubescence fine, very sparse on upper surface. Head broad, wider than prothorax, densely punctured; antennae slender, rather densely ciliated, pubescence longer on inner side; scape longer than head, heavily punctured, second segment small but clearly visible, third segment about twice as long as first and second segments together, fourth and following segments diminishing gradually in length toward apex. Prothorax slightly wider than long, sides arcuate, base constricted; punctation moderately fine, not dense. Elytra as long, or slightly longer than body, piceous, circumscutellar area testaceous; punctation dense, coarse, somewhat rugulose. Body beneath rather sparsely clothed with pale testaceous hairs.

Male: Reddish-testaceous, mesosternum and abdomen piceous; antennae more than twice as long as the body, scape black; elytra slightly more than twice as long as broad. Length, 8 mm.; breadth, 2 mm.

Female: Pale yellowish-testaceous; antennae only one-fourth longer than the body, scape pale at base; elytra nearly four times as long as broad. Length, 9 to 12 mm.

Holotype.—Male [No. 3856, C.A.S.Ent.], *allotype* female [No. 3857] and one *paratype* female; Real de Arriba, July 1933, (Hinton and Usinger; at light).

(15) **Methia lineata** new species

A species suggesting *M. mormona* Linell in elytral pattern, but in addition to its smaller size, it differs from that species in the angulated sides of the prothorax, the coarser, sparser punctation of the head and prothorax, and the short, broad scutellum.

Elongate, parallel-sided, piceous. Head rather coarsely, moderately densely punctured, broader than the prothorax; antennae slender, ciliated, about twice as long as body (♂), scape slender, second segment small but visible, third segment not quite twice as long as scape, fourth and following segments diminishing gradually in length toward apex. Prothorax transverse, sides angulated; punctation fine on disk, coarser at sides. Scutellum as broad as long. Elytra subequal in length to body, piceous, with three narrow, interrupted, longitudinal, testaceous vittae; apices broadly rounded, pale testaceous. Body beneath finely punctured, sparsely clothed with pale, yellowish pubescence mixed with darker hairs. Length, 6 mm.; breadth, 1.5 mm.

Holotype.—Male; Real de Arriba, June, (Hinton and Usinger; at light).

(—) **Brothylus gemmulatus** LeConte

Although not collected by Messrs. Hinton and Usinger, there is a single example of this species in the collection of Dr. E. C. Van Dyke taken at Mazatlan by J. A. Kusche, March 5, 1916. This appears to be the first Mexican record of this species.

(16) **Eburia baroni** Bates

A fine series of *E. baroni* was taken from Inga at Temascaltepec in July, and at light at Tejupilco, June, (Hinton and Usinger).

(17) **Eburia clara** Bates

Rather commonly attracted to light at Real de Arriba in June and July, (Hinton and Usinger).

(18) **Eburia nigovittata** Bates

A single female specimen of this peculiar *Eburia* was captured at Tejupilco, on June 26, (Hinton and Usinger).

(19) **Eburodacrys cruciata** new species

Cruciata differs from all other members of the genus known to the writer in the arcuate eburneous elytral ridges which, when viewed together, appear to form a cross. The pubescence is grayish and the eburneous ridges tinged with reddish.

Elongate, cylindrical, densely clothed with short, grayish pubescence; punctation of head, prothorax, and elytra moderately coarse, dense. Head broad, densely pubescent; antennae slender, slightly longer than the body (♀), scape slender, almost cylindrical, second segment small, third segment one and one-half times as long as scape, fourth and following segments diminishing gradually in length toward apex; third, fourth, fifth, and sixth

segments with a longitudinal sulcus. Prothorax slightly broader than long; antero-lateral and discal tubercles black, shining; lateral spine short, acute. Elytra about three times as long as broad, with an elongate eburneous ridge extending in an arcuate manner from the base at the middle to the suture at basal one-fourth and backward toward the side in median area; two short, confluent, eburneous spots at base; apices emarginate-truncate, not spinose. Legs and ventral surface finely punctured, densely pubescent. Length, 13 mm.; breadth, 3 mm.

Holotype.—Female; Bejucos, July 4, 1933, (Hinton and Usinger).

(20) **Aneflus rugicollis** new species

Rugicollis may be readily distinguished from all other known species of *Aneflus* by the very transverse and strongly rugose pronotum. The species is reddish brown in color with mottled patches of white pubescence on the elytra.

Elongate, subcylindrical, reddish-brown, clothed with short, white, recumbent pubescence. Head rather coarsely punctured; antennae attaining apical one-fourth of the elytra (♂), middle of the elytra (♀), segments three to seven spinose at apex, segments five to eleven carinate; scape moderately stout, not quite three times as long as broad, third segment subequal in length to scape, apical spine as long as second segment, fourth segment distinctly shorter than third, fifth segment subequal to third, remaining segments decreasing gradually in length toward apex. Prothorax transverse, disk coarsely rugosely punctured, sparsely clothed with white, recumbent hairs. Scutellum densely clothed with white pubescence. Elytra about three times as long as broad, coarsely, variolately punctured, sparsely clothed with recumbent pubescence which is condensed into irregular patches giving a mottled appearance; apices bispinose. Ventral surface finely punctured, irregularly clothed with short, white, recumbent pubescence; fifth ventral abdominal segment transverse and emarginate at the apex (♂), elongate and rounded at the apex (♀). Length, 30 to 32 mm.; breadth, 7.5 to 8.5 mm.

Holotype.—Female; Jofutla, Morelos, Mexico [No. 3974, Cal. Acad. Ent.]. *Allotype* male; Tejupilco, June 1933, (Hinton and Usinger), [Collection of the writer]. One *paratype;* Colima, Mexico, (Konradt), [Collection of the United States National Museum].

The Tejupilco example was beaten from *Prosopis.*

(21) **Anepsyra mexicana** new species

This species may be associated with *Anepsyra tenue* LeConte, but the latter species has a much longer spine on the apex of the

third antennal segment, and none on the fourth and fifth segments, the pubescence is denser and longer on the antennae, prothorax, and elytra, and the elytral apices have less acute angles.

Elongate, slender, cylindrical, clothed with white, recumbent pubescence. Head coarsely, moderately closely punctured; antennae slightly longer than the body (♀), not carinate, pubescent, ciliate along inner side, segments three to six spinose at apex; scape short, stout, twice as long as broad, third segment nearly twice as long as scape, apical spine rather stout, remaining segments shorter, subequal. Prothorax one-fourth longer than broad, coarsely, moderately closely punctured; sparsely pubescent. Scutellum densely clothed with white hairs. Elytra fully four times as long as broad, coarsely but not closely punctured, clothed with recumbent, white pubescence; apices emarginate, the angles subacute. Legs slender, coarsely punctured, sparsely pubescent; first segment of the posterior tarsus subequal in length to second and third together. Body beneath finely, moderately densely punctured, clothed with white, recumbent hairs. Length, 12 to 15 mm.; breadth, 2 to 2.5 mm.

Holotype.—Female; Tejupilco, June 1933, (Hinton and Usinger). One *paratype* of questionable sex; Tejupilco in July 1932, (Hinton).

(22) **Anepsyra gracilis** new species

Gracilis is related to *A. mexicana* Linsley and *A. tenue* LeConte, but differs markedly in the more strongly constricted prothorax which is widest behind the middle, the long slender elytra (five times as long as broad) which are suddenly narrowed just before apex and bispinose, and the long, sparse pubescence of the abdomen.

Elongate, slender, cylindrical, sparsely clothed with recumbent, white pubescence. Head coarsely, closely punctured; antennae longer than the body (♂), barely so in the female, not carinate, segments three to six spinose at apex. Prothorax slightly longer than broad, the sides slightly arcuate, widest behind the middle, constricted at base; punctation close, coarse. Scutellum densely clothed with white pubescence. Elytra five times as long as broad, tapering posteriorly, narrowed suddenly just before apex; punctation coarse, not close; pubescence sparse, white, recumbent; apices bispinose. Ventral surface sparsely punctured, sparsely clothed with long, white pubescence. Length, 11 to 13 mm.; breadth, 2 to 2.3 mm.

Holotype.—Male [No. 3859, C.A.S. Ent.], *allotype* female [No. 3860] and one *paratype;* Real de Arriba, June 1933, (Hinton and Usinger). An additional *paratype* was taken in July 1932 by Mr. Hinton.

(23) **Hypermallus longissimus** Bates

A fine series of this species was taken at Real de Arriba in July, (Hinton and Usinger). *H. longissimus* is totally out of place in *Hypermallus,* and should probably constitute a new genus. It is more closely related to *Aneflus* but lacks the flattened, carinate, outer antennal segments of that group.

(24) **Hypermallus gibbulus** Bates

A single example of a species agreeing with Bates' description of *H. gibbulus* was taken at Real de Arriba, *July,* (Hinton and Usinger).

(25-29) **Hypermallus** spp.

Examples of at least five species of uncertain status were taken by Messrs. Hinton and Usinger at Bejucos and Tejupilco. It seems unwise to describe these species until a more comprehensive study of the group can be made.

(30) **Anoplium hirsutum** new species

This very distinct species is provisionally placed in *Anoplium.* It is related to *A. reticolle* Bates and must share with that species its future generic status. It differs from *reticolle* in the more elongate prothorax with condensed patches of white pubescence, and the densely hirsute clothing of the antennae and legs. The two paratypes from Venedio differ from the Bejucos examples in having only a single patch of white pubescence on each side of the prothoracic disk.

Elongate, subcylindrical, clothed with suberect hairs. Head coarsely, variolately punctured; antennae slightly longer than the body in both sexes, densely ciliate within, segments three to five spinose at apex. Prothorax slightly longer than broad, sides feebly arcuate, punctation coarse, close, variolate; pubescence sparse, condensed into two white patches on each side of disk. Scutellum densely clothed with white pubescence. Elytra more than three times as long as broad, less coarsely and more sparsely punctured than prothorax, sparsely clothed with suberect pale hairs; apices obliquely truncate, emarginate. Legs densely hirsute; body beneath shining, sparsely clothed with suberect, pale hairs. Length, 12 to 13 mm.; breadth, 2.5 to 3 mm.

Holotype.—Male; Bejucos, July 3, 1933, [No. 3861, C.A.S. Ent.]. One *paratype;* Bejucos, July 5, 1933, (Hinton and Usinger). Two additional *paratypes* from Venedio, Sinaloa, June 16, 1918, [collection of Dr. E. C. Van Dyke].

PSEUDOPERIBOEUM new genus

Elongate, subcylindrical. Head flattened; eyes coarsely granulated; maxillary palpi longer than labial, last segment triangular; antennae longer than the body (♂), segments three to nine carinate, ciliate within, three to six spinose at apex. Prothorax about as long as broad, with a distinct lateral tubercle. Elytra gradually narrowed posteriorly; apices unispinose. Anterior coxal cavities rounded; intermediate cavities open. Legs slender, femora not clavate, not pedunculate; tibiae slender, carinate; first segment of posterior tarsus subequal to two following segments together.

GENOTYPE: *Pseudoperiboeum subarmatum* n. sp.

This genus is founded on a species related to *Nephalius* and agreeing with that group in the open intermediate coxal cavities, unarmed femora, laterally armed prothorax, and type of vestiture, but differing in the unispinose antennal segments and the slender, non-pedunculate femora. It is also near *Periboeum,* but in that genus the antennae are bispinose and the elytra glabrous.

(31) **Pseudoperiboeum subarmatum** new species

A large black species, with a laterally armed prothorax and short, recumbent pubescence intermixed with coarse, suberect, white hairs.

Black, sparsely clothed with short, yellowish-brown, recumbent pubescence, intermixed with long, coarse, suberect white hairs. Head coarsely, closely punctured; antennae clothed with short, brownish pubescence, ciliate within; scape coarsely punctured, third segment one-half longer than scape, remaining segments subequal in length to fourth. Prothorax coarsely, closely punctured except for four polished discal tubercles and a smooth median longitudinal vitta. Elytra three times as long as broad, coarsely but not closely punctured, pubescence intermixed with coarse, suberect, pale hairs; apices obliquely truncate, outer angle dentiform. Legs clothed with short, recumbent pubescence, intermixed with coarser, suberect hairs. Length, 14 to 18 mm.; breadth, 3 to 4 mm.

Holotype.—Male [No. 3862, C.A.S. Ent.], and numerous *paratypes;* Real de Arriba, July 1933, (Hinton and Usinger).

CONOSPHAERON new genus

Elongate, subcylindrical. Head rather flat between the antennae; maxillary palpi longer than labial, last segment triangular; eyes coarsely granulated; antennae longer than the body (♂), carinate, ciliate, segments three to six spinose at apex. Prothorax transverse, sides angulate with a

conical lateral tubercle, disk flattened. Elytra as wide as prothorax at middle, about three times as long as broad; apices truncate, not spinose. Legs slender, femora pedunculate; tibiae carinate. Intermediate coxal cavities open.

GENOTYPE: *Conosphaeron concolor* n. sp.

A genus closely related to the South American *Sphaeron* and agreeing with it in the pubescent, spinose antennae, swollen, unarmed, pedunculate femora, and open intermediate coxal cavities, but differing in the distinctly angulate and laterally tuberculate prothorax and the unarmed elytral apices.

(32) **Conosphaeron concolor** new species

This interesting little species is characterized by its uniformly pale rufotestaceous color, angulate prothorax, and coarse, variolate punctation of the head and pronotum.

Pale rufo-testaceous, sparsely clothed with suberect pale hairs. Head coarsely, variolately punctured on vertex; antennae densely ciliate within, third segment subequal in length to first and second together, fourth segment one-third shorter than third, remaining segments subequal in length. Prothorax densely, coarsely, variolately punctured except for a smooth, shining, median longitudinal vitta. Scutellum densely clothed with yellowish pubescence. Elytra less coarsely and not closely punctured, clothed with suberect hairs which are longer toward the apex. Abdomen finely punctured, sparsely pubescent. Length, 10.5 to 12 mm.; breadth, 2.3 to 2.76 mm.

Holotype.—Male [No. 3863, C.A.S. Ent.], and several *paratypes;* Tejupilco, July 1933, (Hinton and Usinger). All examples were taken at light.

(33) **Psyrassa pilosella** Bates

Four examples taken at light at Tejupilco, July 1933, (Hinton and Usinger). This species is very distinct by reason of its small size and the scattered flying hairs of the antennae, legs, and body.

(34) **Psyrassa basicornis** Pascoe

Beaten from branches of *Spondias* at Bejucos, July 3-5, 1933, (Hinton and Usinger).

(35) **Psyrassa nigripes** new species

This fine species is pale rufo-testaceous with the legs and antennae black. It is closely related to *P. basicornis* Pascoe, but in the latter species the head, prothorax, scape, and femora are

red and the elytra bluish, and the elytra more closely punctured with the apices bidentate. I am indebted to Mr. K. G. Blair for comparing *nigripes* with the type of *basicornis* in the British Museum.

Elongate, slender, subcylindrical, rufo-testaceous, shining. Head finely, sparsely punctured, glabrous; antennae black, slightly longer than the body (♂), about as long as body (♀), densely ciliate within, segments three to five spinose at apex; scape three times as long as broad, coarsely punctured, third segment slightly shorter than scape, fourth segment a little shorter than third, fifth segment subequal in length to third, remaining segments gradually decreasing in length toward apex. Prothorax subcylindrical, constricted at base and apex; surface shining, coarsely, sparsely punctured, clothed at sides with long, flying hairs. Elytra nearly four times as long as broad, coarsely, sparsely punctured, clothed with short, suberect, yellowish hairs; apices obliquely truncate. Legs slender, black. Ventral surface shining, sparsely, finely punctured, sparsely clothed with short, suberect hairs. Length, 12 to 13 mm.; breadth, 2 to 2.5 mm.

Holotype.—Male [No. 3864, C.A.S. Ent.], *allotype,* female [No. 3865], and six *paratypes;* Bejucos, July 3-5, 1933, (Hinton and Usinger; beaten from flowering trees).

(36) **Psyrassa** (?) **rufofemorata** Linsley new species

A species which departs in many respects from typical *Psyrassa* but which seems better placed in that genus than any other which has been described. Many of its characters are those of *Stizocera* but it differs from the latter in the completely unarmed femora.

Elongate, subcylindrical, black, shining, femora reddish-piceous, body clothed with scattered suberect pale hairs. Head coarsely, closely punctured; antennae longer than the body (♂), segments three to eleven densely pubescent, sparsely ciliate within; scape nearly three times as long as broad, coarsely punctured, third segment subequal to scape, with a long stout spine at apex, fourth segment slightly shorter than third, fifth segment subequal to third, remaining segments diminishing gradually in length toward apex. Prothorax slightly longer than broad, constricted at base and apex, laterally unarmed, coarsely but not closely punctured. Elytra not quite three times as long as broad, gradually narrowed posteriorly, coarsely but not closely punctured, sparsely clothed with suberect pale hairs; apices emarginate, not dentate. Legs clothed with flying hairs Ventral surface finely punctured, clothed with pale, recumbent pubescence. Length, 16 mm.; breadth, 3.5 mm.

Holotype.—Male; Bejucos, July 3, 1933, (Hinton and Usinger).

(37) **Hexoplon smithi** Bates

This beautiful species was taken in some numbers by Messrs. Hinton and Usinger at both Real de Arriba and Tejupilco, on a wide variety of plants and shrubs. It was most abundant in late June and early July.

(38) **Compsa textile** Thomson

One example captured at Tejupilco, June, (Hinton and Usinger).

(39) **Compsa alacre** Bates

This species was very abundant at light at Real de Arriba in May and June.

(40) **Compsa puncticollis** LeConte

A few specimens taken at Tejupilco and Real de Arriba in June and July.

(41) **Compsa tenuata** Bates

Two examples of this pretty little species were taken from flowering trees at Bejucos, July 5, 1933, (Hinton and Usinger).

(42) **Compsa tenuissima** Bates

Found at Tejupilco in July, where it was occasionally taken at light.

(43) **Heterachthes w-notata** new species

This very distinct species may be easily known by the W-shaped pale fascia of the elytra and the long, coarse, widely scattered, pale hairs of the upper suface. *H. w-notata* is placed in *Heterachthes* because of the absence of carinae from the antennae and tibiae. This distinction, however, is a very unsatisfactory one, and many of the genera such as *Compsa, Ibidion,* and *Heterachthes* exhibit intergradation in these characters. The whole group is in great need of revisional study.

Elongate, subcylindrical, brownish-piceous, shining, sparsely clothed with long, erect, coarse, pale hairs. Head coarsely and reticulately punctured, clothed with short, recumbent, golden pubescence which is condensed into irregular patches; antennae not carinate, one and one-half times as long as the body (♂), about as long as body (♀); pubescence short, fine, sparse, intermixed with coarse, erect, white hairs on inner side of segments two to five and at apices of segments two to eleven; scape stout, two and one-half times as long as broad, third segment about seven times as long

as second, fourth and following segments shorter, subequal. Prothorax not quite twice as long as broad, widest at middle, constricted at base and before apex; pubescence short, fine, dense, golden, with a smooth, median vitta. Scutellum densely clothed with fine, short, golden pubescence. Elytra three times as long as broad, shining, sparsely clothed with long, erect, coarse, pale hairs; at middle a zig-zag, pale, W-shaped fascia; apices rotundate-truncate. Femora clavate, unarmed at apex, pale at base, sparsely clothed with short, recumbent pubescence intermixed with scattered erect, coarse, pale hairs; tibiae not carinate; first segment of posterior tarsus subequal in length to the two following together. Length, 8.5 to 11 mm.; breadth, 1.75 to 2 mm.

Holotype. — Male [No. 3866, C.A.S. Ent.], *allotype* female [No. 3867], and four *paratypes;* Tejupilco, June 1933, (Hinton and Usinger).

(44) **Heterachthes usingeri** new species

Most closely related to *H. obtusus* Bates from Nicaragua and sharing with that species its peculiar convex form. In *H. obtusus,* however, the elytra are trifasciate, with all three fasciae attaining the lateral margin, and the antennae slender throughout. The elytral pattern in *H. usingeri* is somewhat suggestive of that in *Ibidion exclamationis* Thomson, but this latter may be distinguished by its slender form and carinate antennae.

Elongate, subcylindrical, dark piceous, sparsely clothed with short, suberect, pale hairs. Head wider than prothorax (♂), scarcely so (♀), shining, coarsely, rugosely punctured on vertex, more sparsely and finely posteriorly; antennae slightly longer than the body (♂), shorter than the body (♀); segments three to six flattened, clothed on inner side with suberect, pale hairs, outer segments more slender, cylindrical, with erect pale hairs at apex. Prothorax one-fourth longer than broad, constricted at base and before apex, shining, sparsely clothed with suberect pale hairs. Elytra three times as long as broad, somewhat arcuate at sides, widest behind the middle; each elytron with an oval, post-median, pale vitta and an elongate, ante-median, pale vitta extending from middle nearly to humerus, surface clothed with suberect pale hairs; first segment of posterior tarsus subequal in length to two following together. Length, 11.5 to 14.5 mm.; breadth, 2.75 to 3.5 mm.

Holotype. — Male [No. 3868, C.A.S. Ent.], *allotype* female [No. 3869], and one *paratype* male; Real de Arriba, July 1933, (Hinton and Usinger).

(45) **Hypexilis longipennis** new species (Pl. II, fig. 5)

Hypexilis longipennis agrees with *H. pallida* Horn in the peculiar structure of the antennae (segments gradually increasing in length toward apex) and other characters of generic importance, but differs in its darker color, strongly clavate and pedunculate posterior femora, anteriorly constricted prothorax, and elongated elytra (nearly four times as long as broad). It is interesting to note that for more than fifty years the Texan *H. pallida* has remained without a congener.

Elongate, slender, brownish-testaceous. Head broader than prothorax, coarsely, closely punctured; antennae twice as long as body (♂), slightly longer than body (♀), segments three to eleven gradually increasing in length toward apex. Prothorax one-half longer than broad, constricted at base and before apex, widest behind the middle; disk flattened, surface coarsely, moderately closely punctured, densely clothed with short pubescence. Elytra at base one-third wider than prothorax behind middle, not quite four times as long as broad; surface coarsely, closely punctured; apices acutely rounded, slightly dehiscent. Posterior femora distinctly clavate and pedunculate; first segment of posterior tarsus distinctly longer than the two following taken together. Length, 7 to 11 mm.; breadth, 1.3 to 2 mm.

Holotype.—Male [No. 3870, C.A.S. Ent.], *allotype* female [No. 3871], and eight *paratypes;* Real de Arriba, May 1933, (Hinton and Usinger). Several additional *paratypes* from the same locality were taken in July 1932, (Hinton). All of the examples were taken at light.

(46) **Obrium cruciferum** Bates

Two examples agreeing well with Bates' description and figure were beaten from *Spondias* at Bejucos, July 3, (Hinton and Usinger).

(47) **Choriolaus pallidulus** new species

This species is easily known by the slender form and pale testaceous color, with eyes, antennae, tibiae and tarsi black. It seems rather suggestive that this and the following species as well as the other known members of the genus are all based upon females.

Small, slender, pale testaceous, eyes, antennae, tibiae and tarsi black. Head prolonged into a muzzle, finely punctured, sparsely clothed with fine, suberect, pale hairs; antennae attaining the middle of the elytra (♀); scape slender, second segment twice as long as broad, third segment

cylindrical, one-fourth longer than scape, fourth segment cylindrical, subequal in length to scape, remaining segments flattened, becoming gradually shorter toward apex. Prothorax campanuliform, shining, sparsely, finely, punctured, sparsely clothed with suberect, pale hairs. Elytra three times as long as broad; coarsely, evenly, punctured, clothed with suberect, yellowish-brown hairs; apices rounded. Legs slender, densely clothed with fine erect hairs; first segment of posterior tarsus longer than remaining segments taken together. Length, 7.5 mm.; breadth, 2 mm.

Holotype.—Female; Temascaltepec, July 1933, (Hinton and Usinger).

(48) **Choriolaus pubicollis** new species

Related to *C. pallidulus* Linsley, but differing in color, in the denser pubescence of the prothorax, and in the irregular elytral pattern.

Elongate, slender, black, prothorax, scutellum, and anterior femora at base, rufo-testaceous. Head finely, sparsely punctured; antennae attaining middle of the elytra (♀), segments three and four subcylindrical, outer segments flattened. Prothorax campanuliform, finely punctured, moderately densely clothed with fine, suberect, reddish-brown hairs. Elytra three times as long as broad; coarsely, irregularly punctured, densely clothed with suberect brownish-hairs; apices rounded. Legs slender, densely clothed with suberect hairs; first segment of posterior tarsus as long as remaining segments together. Length, 7.5 mm.; breadth, 2 mm.

Holotype.—Female; Bejucos, July 4, 1933, (Hinton and Usinger; on flowers).

(49) **Anoplodera aliena** Bates

A fine series of this species was taken under the bark of *Pinus pseudostrobus* at Real de Arriba in May and June (Hinton and Usinger). The species seems better placed in *Anoplodera* than *Leptura* where Bates described it, and is perfectly congeneric with other North American members of the genus.

(50) **Ophistomis biannulatus** new species

This fine species is not closely related to any other known to me. It belongs to the true genus *Ophistomis* by the structure of the antennae, and may be readily known by the yellowish-testaceous color and the black eyes, antennae, apex of femora, tarsi, and second and fifth abdominal segments. The black fascia at apex of the elytra sometimes covers the entire elytral disk, particularly in the female.

Elongate, slender, yellowish-testaceous, with eyes, antennae, apex of femora, tibiae, tarsi, and second and fifth abdominal segments black. Head finely punctured, mouthparts piceous to black; vertex between the eyes black, more coarsely, closely punctured; antennae attaining apex of elytra (♂), apical one-third in (♀); segments three to five slender, cylindrical, outer segments flattened, surface with poriferous areas. Prothorax campanuliform, coarsely, closely punctured, clothed with short, golden pubescence, which becomes black in discal area. Elytra three and one-half times as long as broad, coarsely, closely, regularly punctured, clothed with suberect, golden pubescence; apex black. Legs slender, finely punctured, clothed with short, suberect pile; first segment of posterior tarsus as long as the following segments together. Lower surface finely, closely punctured, clothed with short, golden pubescence. Length, 10.5 to 13 mm.; breadth, 2.75 to 3.5 mm.

Holotype.—Male [No. 3872, C.A.S. Ent.], *allotype* female [No. 3873], and a fine series of *paratypes;* Bejucos, July 3-5, 1933, (Hinton and Usinger; on the flowers of *Spondias*).

(51) **Ommata rubriventris** Linsley

1934. *Ommata rubriventris* Linsley, Rev. de Ent., iv, p. 347.

This species was described from a specimen taken at Tejupilco, July 1932, (Hinton). It is related to *O. elegans* White and *O. maia* Newman, but may be distinguished from each of these by the rather coarse punctation of the prothorax, unicolorous antennae, coarser elytral punctation, and the truncate apices of the elytra.

(52) **Odontocera carinicollis** Linsley (Pl. II, fig. 6)

1934. *Odontocera carinicollis* Linsley, Rev. de Ent., iv, p. 348.

Described from a unique example captured at Bejucos, July 3, 1933, (Hinton and Usinger).

(53) **Acyphoderes cribricollis** Bates

Three examples of this fine species were taken on flowers at Bejucos in July 1933, and another example at Tejupilco, also in July, (Hinton and Usinger). This species differs from typical *Acyphoderes* in the slender body form and very much elongated elytra.

(54) **Acyphoderes sexualis** Linsley (Pl. II, figs. 1, 1a)

1934. *Acyphoderes sexualis* Linsley, Rev. de Ent., iv, p. 349.

This interesting species is related to the Columbian *A. forficula* Goun. and shares with it a peculiar accessory sexual organ at the apex of the abdomen in the male (see fig.). It differs from that

species, however, in the elongated, slender prothorax, long antennae (attaining middle of first abdominal segment in the male and anterior margin of first abdominal segment in female), long posterior femora, and bicolored antennae and tibiae. *A. sexualis* was described from specimens captured at Bejucos, July 4, 1933, on the flowers of *Spondias,* (Hinton and Usinger).

(55) **Bromiades brachyptera** Chevrolat (Pl. II, fig. 3)

An excellent series of *B. brachyptera* agreeing with typical Cuban examples in the United States National Museum Collection (kindly compared by Mr. W. S. Fisher) was taken on *Spondias* at Bejucos, July 3-5, 1933, (Hinton and Usinger). This is the first Mexican record of this peculiar wasp-like species.

(56) **Dexithea klugi** Castelnau & Gory

Several examples captured at Tejupilco in July, (Hinton). This species may be distinguished from *D. fabricii* which it resembles, by the more elongated form and the presence of a narrow thread-like dark line just posterior to, and parallel with, the subbasal elytral fascia.

(57) **Cyllene erythropus** Chevrolat

Rather common at Tejupilco in late July, (Hinton).

(58) **Cyllene crinicornis** Chevrolat

Taken at Real d'Arriba in July, (Hinton and Usinger). This species may be separated from the preceding by the presence of four (rather than three) transverse yellow fasciae on the prothorax.

(59) **Trichoxys vitticollis** Castelnau & Gory

One specimen captured at Real de Arriba on May 28, 1933, (Hinton and Usinger). In elytral markings this species resembles a *Cyllene,* particularly *C. erythropus* or *C. crinicornis,* but may be readily known by the longitudinal prothoracic vittae.

(60) **Trichoxys ochraetheoides** new species

This species resembles an *Ochraethes,* particularly *O. nigritus* Bates, but because of its slender form and prominent mesosternum, it must be placed in the genus *Trichoxys.* From *O. nigritus* it differs in the more pronounced sutural elytral sulcus, the obliquely-truncate and dentate rather than rounded elytral apices, and the more distinct and contrasting coloration.

Elongate, sender, black; pubescence short, scale-like, intermixed with longer flying hairs. Head black, clothed rather densely with decumbent yellow pubescence; antennae slender, black, attaining the middle of the elytra; segments two to six with bristles on the inner side; scape elongate, second segment nearly half as long as scape, third and fourth segments subequal in length to first, remaining segments a little longer, also subequal. Prothorax a little wider than long, rounded at the sides and constricted at the base which is slightly wider than the apex; punctation moderately fine, not sparse; pubescence yellow-green, recumbent, less dense than on head, intermixed with longer, pale flying hairs. Elytra at base one fourth wider than prothorax, two and one-half times as long as broad, depressed at the suture; pubescence yellow, condensed into an indistinct narrow band connecting the humeri and extending back along the elytral margin to the middle, six large spots, of which only the median and apical attain the suture, and two small spots, one ante- and one post-median, placed on the suture; median fascia L-shaped, the anterior portion extending forward along the suture; apices obliquely truncate with the exterior angle dentate. Legs slender, black; tarsi reddish, first segment of posterior pair longer than second and third together, third segment clothed with a dense, yellow, pubescent sole. Body beneath clothed with yellow-green hairs. Length, 15 mm.; breadth, 4 mm.

Holotype.—A unique; Temascaltepec, (Hinton).

(61) **Ochraethes sommeri** Chevrolat (=**O. circulifer** Chev.)

Several specimens taken at Temascaltepec in late July, (Hinton). *Ochraethes circulifer* is inseparable from *O. sommeri,* as is also *Clytus tibialis* Cast. and Gory. This last was omitted by Aurivillius (1912) in the Coleopt. Catalogus.

(62) **Ochraethes obliquus** Chevrolat

One example, not quite typical, collected at Temascaltpec, July, (Hinton).

(63) **Ochraethes pollinosus** Chevrolat

Taken at Temascaltepec, July, on flowers, (Hinton).

(64) **Ochraethes z-litterata** Chevrolat (=**O. citrinus** Bates nec Chev.)

Not uncommon at Temascaltepec in late July, (Hinton). This is the *Ochraethes citrinus* of Bates.[1]

(65) **Triodoclytus brevicornis** Chevrolat

Two specimens, Temascaltepec, July, (Hinton). This and the following species are very similar in coloration but in *brevicornis*

[1] Biol. Cent.-Am., Col., v, p. 297, (1885).

the prothorax is much narrower in relation to the base of the elytra and the antennae very short, with the last six segments enlarged. In the last character *T. brevicornis* differs from T. *lanifer* Lec. in which the antennae are tapering, but as the two seem congeneric in other respects, I have included *brevicornis* in *Triodoclytus*.

(66) **Triodoclytus virescens** Chevrolat

Three examples from Temascaltepec, (Hinton) differ from Chevrolat's description in having obliquely-truncate rather than rounded elytral apices, but seem best referable to this species.

Table of North and Central American Genera of Tillomorphini

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   Prothorax not constricted apically; fifth segment of antennae incrassate. *Pempteurys*

(67) **Eplophorus longicollis** new species (Pl. II, fig. 4)

This species is very distinct by reason of the elongated prothorax, strongly spinose antennae, and the long and short eburneous ridges of the elytra.

Elongate, cylindrical, rufous, with head, antennae, prothorax, abdomen, and apex of elytra darker; pubescence sparse, white. Head coarsely, rather densely punctured; eyes divided; mouthparts rufous, apex of mandibles piceous; antennae slightly longer than the body (♂); scape rufous, not slender, second segment rufous, small, slightly longer than broad, third segment piceous, not quite twice as long as scape, with a stout spine at apex, apical spine more than two-thirds as long as fourth segment, fourth segment also spinose, piceous, three-fifths as long as third, fifth segment rufous, apex annulated with piceous, with a short apical spine, six and following segments not spinose, diminishing in length toward apex, eleventh segment slightly longer than tenth. Prothorax cylindrical, one-half longer than broad; longitudinally strigose, base constricted with a transverse band of white pubescence. Scutellum clothed with white hairs. Elytra not quite three times as long as broad, with a median transverse elevated ivory fascia extending from lateral margin nearly to suture, and a short ante-median ivory fascia placed on the suture; punctation coarse and dense over basal two-thirds, fine and sparse apically; disk with a subbasal patch of white pubescence and a similar subapical patch extending from the suture to the lateral margin; apices truncate. Body beneath rufous; apex of prosternum piceous, transversely strigose, basal portion coarsely punctured; meso- and metasternum sparsely punctured, margined at the sides with white pubescence; abdomen very sparsely punctured, piceous, shining, basal segment with a patch of white pubescence near margin. Length, 8.5 mm; breadth, 1.75 mm.

Holotype.—Male; Bejucos, July 3, (Hinton and Usinger; on the flowers of *Spondias*).

(—) **Eplophorus bicinctus** new species

This species is not quite typical of *Eplophorus* because of the short spine at the apex of the third antennal segment, but otherwise seems perfectly congeneric with the preceding species. It may be readily distinguished from the other members of the genus by the parallel, equal, eburneous elytral fasciae.

Elongate, cylindrical, rufo-testaceous, with the head, prothorax, and apex of elytra darker; pubescence sparse, white. Head coarsely punctured, cheeks and mouthparts rufous; antennae rufo-testaceous, apex of segments faintly darker; pubescence sparse, coarse, confined to the inner side of segments; scape slender, about as long as third segment, second segment

small, third segment with a short spine at apex, fourth segment two-thirds as long as third; remaining segments diminishing in length toward apex. Prothorax one-fourth longer than wide, piceous, sides at base rufous; base constricted with a transverse band of white pubescence; punctation coarse, dense, strigose on disk. Scutellum white. Elytra at base two-fifths as wide as long, slightly broader than prothorax; base scarcely tumid, with a subbasal patch of white pubescence; median and ante-median areas, each with a transverse, parallel, eburneous ridge which attains the lateral margin but not the suture; behind the median ivory mark is a broad black band, wide at the sides but narrowed at the suture, margined behind with a white band of pubescence; apices dark, emarginate-truncate. Legs slender, rufo-testaceous; femora clavate, tarsi short. Length, 7.5 mm.; breadth, 1.75 mm.

Holotype.—Female [No. 3874, C.A.S. Ent.]; Los Mochis, Sinaloa, Mexico, July 25, 1922, (C. T. Dodds), [Van Dyke Collection, California Academy of Sciences]. The specimen was taken in association with the ant, *Pseudomyrma gracilis* Fab. subsp. *mexicana* Roger.

(68) **Cleozona rufipes** Bates

One example, Tejupilco, July, (Hinton), with the anterior pair of legs black and the two posterior pair reddish.

There is little to separate *Cleozona* from *Eplophorus*. Bates [2] in his description of the genus says, ". . . . this elegant insect resembles . . . . other genera of the subfamily Tillomorphini, from all of which it is distinguished by its slender, grooved and spined antennae, and carinated tibiae". However, I find these characters also present in all of the species of *Eplophorus* known to me. The femora are less suddenly clavate in *Cleozona* and seem to offer the only difference worthy of note.

(69) **Euderces cribripennis** Bates

Two specimens, taken at Tejupilco, July, (Hinton and Usinger).

CLYTODERUS new genus

Short, flattened. Head transverse, enclosed within the prothorax to the depth of the eyes; eyes entire, small, rounded; antennal tubercles rather widely separated; antennae eleven-segmented, about three-fourths as long as body; scape slender, curved, second segment small, third segment slender, slightly longer than first and second together, remaining segments

[2] Trans. Ent. Soc. Lond., 1874, p. 223 (1874).

shorter, stouter, subequal but diminishing in length toward apex. Prothorax about as long as broad, globular,. narrower at base than at apex. Elytra elongate, without an ante-median depression or eburneous fasciae; apices truncate. Legs slender; femora clavate; posterior tibiae arcuate, not carinate; tarsi short, first segment of posterior pair shorter than second and third segments together.

GENOTYPE: *Clytoderus pygmaeus* n. sp.

This genus is founded on a peculiar little ant-like longicorn with a very large prothorax and a narrow, deeply sunken head. It is related to *Tilloclytus* but differs from that genus in the widely separated antennal tubercles, the absence of an oblique ante-median elytral depression, and in the short first segment of the posterior tarsus which is not as long as the second and third segments together.

(70) **Clytoderus pygmaeus** new species

Small, rufous, with the eyes, abdomen, and apical two-thirds of elytra dark. Head coarsely, variolately punctate; antennae piceous, first and second segments rufous. Prothorax coarsely, variolately punctured. Elytra about three times as long as broad, with a short elevated subbasal ridge, bounded behind by an oblique white fascia; basal one-third reddish; median area black, with an anterior narrow transverse fascia of short, oblique, whitish hairs; apical one-third grayish-black; punctation coarse, dense. Legs dark reddish, clothed with a few scattered suberect white hairs. Body beneath finely punctured; meso- and metasternum with a few dense patches of white pubescence at sides and apex. Length 4 mm.; breadth, 1.3 mm.

Holotype.—Female?; Bejucos, July 4, (Hinton and Usinger; on dry grass in the company of small, reddish ants).

(71) **Tetranodus mexicanus** new species

This species is with considerable hesitation referred to the genus *Tetranodus* as all of the specimens at hand are females. They agree, however, so closely with the female of *T. niveicollis* Linell in most important characters, that it seems justifiable to associate them provisionally together.

Black, very sparsely clothed with pale flying hairs. Head densely, coarsely punctured; antennae (♀) variable, pale to piceous, scape moderately stout, second segment small, slightly longer than broad, third segment a little longer than scape, fourth segment two-thirds as long as third, fifth segment slightly longer than fourth, seventh segment incurved,

remaining segments decreasing gradually in length toward the eleventh which is longer than the tenth. Prothorax about one-third longer than broad, twice as long as basal width; base strongly constricted, apex one-fourth wider than base, slightly narrower than mid-portion. Elytra at base about as broad as the prothorax, with a slight transverse depression just anterior to the elevated ivory fascia; punctation moderately coarse, not dense, somewhat finer toward apex; apices rotundate-truncate. Abdomen shining. Legs short; tibiae arcuate; femora clavate; tarsi obscurely rufous, first segment not equal in length to second and third together. Length, 4.5 mm.; breadth, 1 mm.

Holotype.—Female, and two *paratypes*, also females; Tejupilco, June 29, (Hinton and Usinger). The specimens were taken from mesquite, *Prosopus*.

Some of the differences between the two species may be set down as follows:

Rufous, apical half of elytra black, prothorax with a transverse basal band of white pubescence; elytra with an obtuse subbasal elevation; antennae with seventh segment straight; femora strongly clavate. 4-5 mm. Brownsville, Texas.....*niveicollis* Linell

Black, elytra without subbasal elevation; antennae with seventh segment incurved; femora less strongly clavate. 3-5 mm., Mexico. *mexicanus* n. sp.

(72) **Rhopalophora laevicollis** LeConte

A fine example, differing from typical Texan specimens only in the more distinctly golden pubescence of the prothorax, was beaten from a flowering tree at Bejucos, July 3, 1933, (Hinton and Usinger). A second example agreeing with the Bejucos specimen was captured at Venedio, Sinaloa, by Mr. J. A. Kusche, [collection of Dr. E. C. Van Dyke].

(73) **Rhopalophora longipes** Say

Two examples taken at Tejupilco, June 1933, (Hinton and Usinger).

(74) **Rhopalophora incrustata** Chevrolat

This rather common and widespread Mexican species was taken in series on *Salix* at Real de Arriba and Temascaltepec in July, (Hinton and Usinger).

(75) **Rhopalophora punctatipennis** new species

This species is related to *E. mimocicollis* Chev., but is characterized by the long slender prothorax and the coarser, closer, subseriately arranged, punctation of the elytra.

Elongate, subcylindrical, black, prothorax reddish above and below. Head finely, closely punctured; antennae longer than the body in both sexes. Prothorax one-third longer than broad; punctation coarse, sparse (♂), fine, sparse (♀). Elytra three times as long as broad, coarsely, closely punctured, clothed with short, pale, subcrenulate hairs; apices truncate. Legs slender; femora suddenly clavate; first segment of posterior tarsus longer than two following together. Body beneath densely clothed with short, white pubescence. Length, 6 to 8 mm.; breadth, 1.5 to 2 mm.

Holotype.—Male [No. 3875, C.A.S. Ent.], *allotype* female [No. 3876], and several *paratypes*, Bejucos, July 3-5, 1933. (Hinton and Usinger).

(76) **Cosmisoma alboscutellata** new species

This species may be placed near *C. reticulatus* Bates, from which it differs in the short, oval prothorax, uniformly black antennae, and the white pubescence which is condensed into a dense patch on the scutellum and meso- and metathoracic episterna.

Black, scutellum and meso- and metathoracic episterna in part, clothed with dense, fine, silvery-white pubescence. Head coarsely, closely punctured; antennae (♂) one-half longer than the body; scape three times as long as broad, coarsely punctured, third segment one-third longer than the scape; slender, fourth and fifth segments subequal to third, the fifth with a tuft of black hairs at apex, remaining segments shorter, subequal. Prothorax slightly long, seventh, longer than broad, sides more or less evenly rounded, base slightly constricted, punctation coarse, close, variolate. Elytra one and one-half times as long as broad, coarsely, confluently punctured; apices rounded. Legs slender; femora suddenly clavate, sparsely clothed with short white hairs; anterior tibiae pale; first segment of posterior tarsus longer than two following together. Lower surface finely, closely punctured, clothed with pale, silvery-white pubescence. Length, 8.5 mm.; breadth, 2.5 mm.

Holotype.—Female, Bejucos, July 3, 1933. (Hinton and Usinger).

(77) **Ornithia mexicana** Sturm

Two examples of this beautiful species were taken on *Aristolochia* at Bejucos in July, and two others at Tejupilco in June 1933. (Hinton and Usinger).

(78) **Chrysoprasis hypocrita** Erichson

A fine series captured on the flowers of *Spondias* at Bejucos, July 3-5, 1933, (Hinton and Usinger). The majority of the individuals are metallic green in color but in several the thoracic coloration has a tendency toward blue.

(—) **Zenochloris vandykei** new species

This species is closely related to *Z. barbicauda* Bates, but may be distinguished from that species by the shorter antennae, which in the female attain only the basal one-third of the elytra (in the female of *barbicauda* the antennae are nearly as long as the body), the longer antennal scape, and the antennae with segments three to five ciliate at apex. The latter has also more sharply defined and carinate elytral epipleurae. The writer is indebted to Dr. E. C. Van Dyke for the privilege of studying this species.

Elongate, subparallel, dark green, opaque, abdomen rufo-testaceous. Head coarsely punctured; antennae (♀) attaining the basal third of elytra; scape slightly longer than the third segment, segments three to five ciliate at apex, outer segments flattened, serrate. Prothorax as long as broad, sides subangulate, widest slightly behind the middle, base wider than apex; punctation coarse, moderately close. Elytra two and one-fourth times as long as broad, coarsely but not closely punctured; apices truncate. Legs slender, posterior femora reaching beyond apex of elytra; posterior tibiae sinuate; first segment of posterior tarsus longer than following two together. Lower surface closely, coarsely punctured; abdomen clothed with short, yellowish, suberect hairs. Length: 12.75 mm.; breadth 3.5 mm.

Holotype.—Female [No. 3877, C.A.S. Ent.]; Mazatlan, Mexico, September 15, 1918, (Mr. J. A. Jusche), [Collection of Dr. E. C. Van Dyke].

(79) **Stenosphenus cribripennis** Thomson

A small series of this rather common Mexican species was taken at Bejucos and Tejupilco in July, (Hinton and Usinger).

(80) **Stenosphenus trispinosus** Bates

Taken in numbers at Temascaltepec in early July, (Hinton and Usinger). The species closely resembles the preceding but differs in the trispinose elytral apices.

(81) **Stenosphenus blairi** new species

Blairi is easily known by its small size, short, transverse prothorax, and coloration (reddish, with antennae, tibiae, tarsi, and elytra black). It is related to *S. amabilis* Newman, but the latter species has the antennae shorter than the body and the elytral apices obliquely truncate with the angle spiniform. I take great pleasure in dedicating this pretty little species to Mr. K. G. Blair as a slight tribute for the kind assistance he has so often given the writer.

Short, small, rufo-testaceous, antennae (except scape), tibiae, tarsi, and elytra black. Head rather coarsely, closely punctured; antennae slightly longer than the body (♂), clothed with fine, recumbent, yellowish pubescence, intermixed with longer flying hairs along inner side and at apex of segments; segments three to seven spinose at apex. Prothorax slightly transverse, smooth, shining, with a few scattered punctures and suberect hairs. Elytra slightly more than twice as long as broad, coarsely, moderately closely punctured, clothed with long, suberect, pale hairs; apices emarginate, the angles dentiform, not spinose. Legs clothed with suberect pale hairs; abdomen shining, sparsely, finely punctured, sparsely clothed with very fine, short, pubescence. Length, 6.5 mm.; breadth, 1.75 mm.

Holotype.—Male; Tejupilco, June, 1933, (Hinton and Usinger).

(82) **Stenosphenus rubidus** new species

This species suggests *Ironeus*, particularly *I. pulcher* Bates, with which it agrees in the carinate antennae and tibiae and the rugose prothorax. However, because of the slender femora, finely granulated eyes, and the structure of the mesosternum and intermediate coxal cavities, it seems best associated with *Stenosphenus*. *S. rudibus* may be easily recognized by its large size, reddish color with antennae and legs black, and the stout, subcylindrical antennal scape.

Elongate, moderately convex, rufous, legs and antennae black, abdomen piceous. Head rather flat between the antennae, moderately coarsely, closely punctured; antennae longer than the body (♂), densely pubescent, segments three to eight spinose at apex, sparsely ciliate within; scape subcylindrical, moderately stout, rather coarsely punctured, third segment one-half longer than scape, remaining segments shorter, subequal. Prothorax a little longer than broad, narrowed anteriorly, slightly constricted at base; disc feebly, transversely rugose, finely sparsely punctured, clothed with scattered suberect hairs. Scutellum densely pubescent. Elytra three times as long as broad, narrowing gradually toward apex, moderately coarsely, but not closely punctured, clothed with short, suberect, yellowish hairs;

apex feebly piceous; apices emarginate, bispinose. Legs slender, tibiae carinate; first segment of posterior tarsus subequal to two following together. Prosternum between the coxae subparallel, mesosternal piece vertical in front, flat behind; intermediate coxal cavities closed; abdomen coarsely, not closely punctured, clothed with suberect yellowish hairs. Length, 16 to 18 mm.; breadth, 3.7 to 4 mm.

Holotype.—Male [No. 3878, C.A.S. Ent.], and two *paratypes;* Bejucos, July 3-5, 1933, (Hinton and Usinger).

STENOSPHENOPSIS new genus

Elongate, moderately convex. Head short, front transverse, vertex flat; palpi very unequal, last segment slightly triangular; eyes finely granulated, moderately convex; antennae slender, longer than the body (♂), segments three to seven carinate, spinose at apex. Prothorax wedge-shaped, narrowed anteriorly, feebly longer than broad, constricted at base. Elytra elongate, narrowed gradually posteriorly, apices bidentate. Prosternum moderately narrowed between the coxae; mesosternal piece with a polished, shining tubercle; metathoracic episterna narrow, parallel. Anterior coxal cavities feebly angulated externally, intermediate coxal cavities closed. Legs slender, femora slightly clavate; first segment of posterior tarsus subequal to the two following together.

GENOTYPE: *S. nitidicollis n. sp.*

The species upon which this new genus is founded possesses many perplexing characters. It appears to be intermediate between *Ironeus* and *Stenosphenus,* two genera which, in the opinion of the writer, are much more closely related than their position in our catalogue would indicate. From *Ironeus* it may be distinguished by having the intermediate coxal cavities closed externally and the eyes very finely granulated. It differs from *Stenosphenus* mainly in the tuberculate mesosternum and clavate femora.

(83) **Stenosphenopsis nitidicollis** new species

A species characterized by a black, shining prothorax and pubescent elytra which have three polished, longitudinal vittae.

Black, shining. Head coarsely punctured except for an irregular smooth area on vertex; antennae one-third longer than the body (♂), spines on segments three to six prominent, on segment seven obscure; scape nearly three times as long as broad, coarsely, closely punctured, remaining segments slender, pubescent, ciliate along inner side. Prothorax smooth, shining, with scattered fine punctures and short erect hairs. Elytra nearly three times as long as broad, clothed with white, recumbent pubescence,

with three longitudinal, polished vittae on each side of suture; apices emarginate dentate. Legs sparsely clothed with white pubescence. Sternum and abdomen at sides clothed with dense, short, white pubescence intermixed with longer suberect hairs; discal area shining, subglabrous. Length, 15 to 19 mm.; breadth, 3.5 to 4 mm.

Holotype.—Male [No. 3879, C.A.S. Ent.], and three *paratypes;* Bejucos, July 3, 1933, (Hinton and Usinger).

(84) **Stenygra histrio** Serville

Taken in fair series at Tejupilco in the latter part of June and early July, (Hinton and Usinger).

(85) **Atimia mexicana** Linsley

1934. *Atimia mexicana* Linsley, Pan Pacific Ent., x, p. 24.

This species was described from examples taken at Real de Arriba, in June 1933, on *Thuja occidentalis,* by Messrs. Hinton and Usinger. It is related to *Atimia confusa* Say, from eastern United States, but may be distinguished by its larger size, elongated form, parallel prothoracic vittae, and truncate elytral apices.

(86) **Elytroleptus eros** Bates

A single male example, captured at Tejupilco, June 1933, (Hinton and Usinger). The specimen agrees well with Bates' description except that the anterior femora are rufo-testaceous with only the base and apex black.

(87) **Elytroleptus pallidus** Thomson

A small series of typical *E. pallidus* was collected at Tejupilco in June 1933, (Hinton and Usinger).

(88) **Elytroleptus longipennis** Bates

One example, a female, taken at Tejupilco in June, (Hinton and Usinger). This species rather closely resembles the preceding, but is larger, slightly more reddish in color, and has distinctly more elongated elytra.

(89) **Elytroleptus scabricollis** Bates

Two specimens captured at Tejupilco, June 1933, and one specimen taken at Bejucos, July 3, 1933, (Hinton and Usinger). The two Tejupilco examples have the prothoracic disk margined at the sides with yellow; in the Bejucos example, the prothorax is uniformly black.

(90) **Elytroleptus grandis** new species

This is the largest known member of the genus and is easily recognizable by the disposition of the testaceous markings of the prothorax and elytra.

Elongate, flattened, black; head, prothorax, and elytral fasciae yellowish-testaceous. Head coarsely but irregularly punctured, vertex and mouth-parts clothed with recumbent golden pubescence; antennae black, attaining middle of elytra, moderately densely punctured, clothed with short, suberect, black pubescence; scape reverse cone-shaped, third segment a little longer than fourth, fifth segment subequal to third, segments three and four subcylindrical, densely fringed with black hairs, segments five to eleven flattened, triangular, eleventh segment appendiculate. Prothorax transverse, widest just behind the middle; punctation coarse, the punctures confluent and somewhat rugose; pubescence fine, dense, recumbent, golden in yellowish area, darker in the black median and lateral, longitudinal vittae. Scutellum black, glabrous, subtriangular. Elytra gradually dilated from base nearly to apex, distinctly tricostate; humeral area and a broad median fascia yellowish-testaceous; pubescence golden in pale fasciae, black in dark areas; punctation moderately coarse, dense; apices separately rounded. Body beneath black, shining, sparsely punctured, sparsely clothed with suberect black hairs. Legs short; anterior femora at apex and anterior tibiae at base, pale testaceous; tarsi short, densely padded beneath with erect golden pubescence. Length, 15 mm.

Holotype. — A unique; Tejupilco, June 1933, (Hinton and Usinger).

(91) **Crioprosopus basileus** Bates

Several specimens taken at Tejupilco, June, (Hinton and Usinger), from a species of *Acacia.* A female example is of the variety described by Bates [3] with the prothorax almost entirely rufous.

(92) **Stenaspis pilosella** Bates

A single example, captured a Real de Arriba, July, (Hinton).

(93) **Deltaspis thoracica** White

One specimen, agreeing well with White's description, taken at Temascaltepec, July, (Hinton).

(94) **Deltaspis variabilis** Bates

A long series, Temascaltepec, July, (Hinton). Examples vary from uniformly black, through black with a red prothorax, to

[3] Biol. Cen.-Am., Col., v, p. 320 (1885).

reddish with head, antennae, legs, anterior and basal prothoracic margins, and circumscutellar area black.

(95) **Deltaspis rubriventris** Bates

Large numbers of this beautiful, but not uncommon longicorn were captured a Temascaltepec in July, (Hinton).

(96) **Metaleptus binoculatus** Bates

A fine large example, Tejupilco, June, (Hinton and Usinger).

(97) **Metaleptus comis** Bates

Taken in small series at Bejucos, July 3-5, (Hinton and Usinger). The specimens were all captured by beating various types of flowering trees and shrubs.

(98) **Metaleptus discoideus** new species

This species is opaque coccineous above, with five black prothoracic spots and a black sutural, elytral fascia. The elytral fascia begins at apical third and becomes gradually narrower anteriorly, in some examples not attaining the base. The species digresses in many respects from *M. angulatus* Chev., the type of the genus, but apparently no more so than such divers forms as *M. femoratus* Schaeffer and *M. pyrrhulus* Bates.

Elongate, slender, parallel-sided, black; head, thorax, and elytra opaque, coccineous; sparsely clothed with pale, suberect pubescence. Head coarsely and moderately closely punctured; antennae nearly twice as long as body (♂), attaining apical one-third of elytra (♀), scape moderately stout, rufo-piceous, coarsely, punctured, remaining segments slender. Prothorax slightly broader than long, sides subangulate but not tuberculate; surface apaque, coarsely and closely punctured; disk with a central black spot just behind the middle, an anterior spot on each side of middle, and two small, less conspicuous basal spots. Scutellum subtriangular, black, moderately densely clothed with recumbent, pale pubescence. Elytra more than three times as long as broad, coccineous with a black sutural fascia extending from apical one-third to, or nearly to, base; punctation moderately dense, coarse; pubescence pale, short, suberect; apices broadly rounded. Body beneath black, finely, closely punctured, densely clothed with short, recumbent, silvery pubescence, intermixed with scattered larger, suberect, pale hairs. Prosternum rather convex between the coxae. Legs long, slender; anterior femora rufo-piceous, posterior femora extending beyond apex of elytra. Length, 14 to 15 mm.; breadth, 3.7 mm.

Holotype.—Male [No. 3880, C.A.S. Ent.], *allotype* female [No. 3881], and several *paratypes;* Tejupilco, June, (Hinton and Usinger). Additional *paratypes* from Bejucos, July 3-5, (Hinton and Usinger).

PSEUDODELTASPIS new genus

Elongate, subparallel. Head moderately short, not strongly impressed between the antennae; palpi short, the maxillary a little longer than the labial, last segment subtriangular; mandibles short, entire, not sharply pointed; antennae slender, twice as long as the body (♂), flattened, serrate, shorter than the body (♀), scape moderately stout, third segment about twice as long as scape, fourth segment a little shorter than third, remaining segments increasing gradually in length toward apex (♂), decreasing in length toward apex (♀). Prothorax transverse, armed with stout lateral tubercles; disk with a polished median longitudinal carina and a polished callosity on each side near base. Scutellum triangular, about as broad as long, pointed behind. Elytra about three times as long as broad, flattened, apices flexuose, with three distinct angles. Legs long, slender; posterior femora extending beyond apex of body; posterior tarsi slightly shorter than the posterior tibiae, first segments longer than second and third taken together. Prosternum narrow between the coxae, trunctate behind; mesosternum declivous in front, distinctly tuberculate; metathoracic episterna broad.

GENOTYPE: *Pseudodeltaspis cyanea* n. sp.

The species upon which the above genus is founded bears a great superficial resemblance to certain members of the genus *Deltaspis,* from which it may be readily distinguished by the unnotched mandibles, tuberculate mesosternum, and long slender legs and antennae. It appears to be more closely related to *Triacetelus* Bates, with which it agrees in most of its characters, differing mainly in the more slender form, shorter, broader head, irregular prothoracic sculpture, type of punctation and pubescence, and flattened, serrate antennae of the female.

(99) **Pseudodeltaspis cyanea** new species

Male: Black, elytra virescent green. Head closely, finely punctured, the punctures becoming coarser and sparser on vertex; antennae more than twice as long as body, slender, segments from fourth gradually increasing in length toward apex, eleventh segment feebly appendiculate. Prothorax opaque, finely closely punctured except for median and basal callosities, clothed at sides with moderately long, pale, flying hairs. Elytra coarsely and somewhat confluently punctured, clothed with short, suberect, black pubescence. Body beneath closely, finely punctured, clothed with recumbent silvery pubescence. Legs coarsely, sparsely punctured, clothed with suberect dark and pale hairs. Fifth ventral abdominal segment emarginate at apex. Length, 17.5 mm.; breadth, 4.5 mm.

Female: Elytra bluish. Antennae shorter than the body, flattened, serrate, segments from fourth gradually decreasing in length toward apex. Fifth ventral abdominal segment truncate at apex. Length, 13 to 14 mm.; breadth, 3.5 to 4 mm.

Holotype.—Male [No. 3882, C.A.S. Ent.], *allotype* female [No. 3883], and several *paratypes* (all females); Bejucos, July 3-5, (Hinton and Usinger).

The two sexes differ markedly in color and structure of the antennae. In the male the elytra are metallic greenish and the antennae very long and slender. In the female the elytra are bluish and the antennae short, serrate.

(100) **Triacetelus sericatus** Bates

Taken at Bejucos, July 3-5, (Hinton and Usinger). The female of this species was unknown to Bates. It is similar to the male in coloration, but the antennae are only as long as the body and slender throughout.

(101) **Oxoplus ornaticollis** Lacordaire

Two examples, taken at Real de Arriba, July, (Hinton).

(102) **Tylosis puncticollis** Bates

A small series of the typical form of *T. puncticollis* was taken at Temascaltepec, July, (Hinton).

(103) **Sphaenothecus trilineatus** Dupont

Three examples, captured at Temascaltepec, July, (Hinton).

(104) **Sphaenothecus (Lophalia) cyanicollis** Dupont

One specimen, taken at Temascaltepec, July, (Hinton).

(105) **Ischocnemis costipennis** Thomson

Taken in rather long series at Temascaltepec, July, (Hinton). The species is very variable, although the majority of specimens are of the type described by Thomson.

(106) **Ischocnemis sexualis** Bates

One pair, Temascaltepec, July, (Hinton). It is significant that most of the species in this group are found in late summer (July and August).

LEPTOBATYLE new genus

Elongate, subparallel. Head narrow, feebly sulcate between the antennae; antennae slightly longer than the body, third segment distinctly longer than fourth, segments four to seven subequal in length, slender, segments eight to eleven somewhat flattened. Prothorax transverse, swollen, sides evenly rounded from base to apex; posterior angle acute, produced. Scutellum transverse, heart-shaped. Elytra flattened, more than three times as long as broad, coarsely, confluently punctured, without trace of costae; apices sinuate, almost tridentate. Legs slender, attaining apex of elytra; posterior tarsi short, two-thirds as long as posterior tibiae. Mesosternum moderately convex, rather sharply inclined.

GENOTYPE: *Leptobatyle inflaticollis* n. sp.

The anomalous type of this genus bears a striking resemblance to *Stenobatyle cribrata* Casey and, in spite of its short posterior tarsi and subvertical mesosternum, seems more closely related to *Stenobatyle, Ischocnemis,* and *Entomosterna,* than to *Sphaenothecus* and the other genera with which it shares most of the above characters. From both groups of genera, it may be distinguished by the coarsely punctured, non-costate elytra, transverse, heart-shaped scutellum, and greatly inflated prothorax.

Casey[4] designates as the type of *Entomosterna* Chev.[5] a species which he describes as *E. unicostata* n. sp. This designation is, of course, totally unwarranted, the only possible genotype being *E. cruentata* Chevrolat, which is the first species described by Chevrolat following his original definition of the genus, and the only species placed by him in his Primiere Division of the group. As the genotype of *Ischocnemis* Thomson, Casey designates *I. tripunctata* Thomson. The species described by Thomson was *I. costipennis* not *I. tripunctata,* the latter being an unpublished Dejean manuscript name.

(107) **Leptobatyle inflaticollis** new species

This species is remarkable for the coarse, variolate punctation. The punctures of the prothorax and elytra are very large, those of the head, scape, legs, and under surface being only half the diameter but still rather coarse. In addition to the coarse

[4] Mem. Coleopt., III, p. 326 (1912).

[5] Ann. Soc. Ent. France, (4), II, p. 752 (1862).

punctures, the entire surface is very finely and densely punctured. *L. inflaticollis* is black except for the yellow areas of the prothorax which extend partially on to the prosternum and are divided above by a black longitudinal vitta and a black basal and apical marginal line.

Slender, black, almost devoid of pubescence above; prothorax yellowish, anterior and basal margins and median longitudinal vitta, black. Head coarsely punctured; antennae slightly longer than the body, scape moderately coarsely punctured, remaining segments finely punctured. Prothorax inflated, densely covered with large, variolate punctures except on median longitudinal line. Scutellum closely, moderately coarsely punctured. Elytra at base about as wide as prothorax at middle, covered with coarse, variolate, and somewhat confluent punctures. Body beneath moderately coarsely punctured, sparsely clothed with recumbent pale pubescence. Length, 10.75 mm.; breadth, 2.5 mm.

Holotype.—Male; a unique; Bejucos, July 5, (Hinton and Usinger).

(108) **Stenobatyle prolixa** Bates

A single male example, Bejucos, July, (Hinton and Usinger).

(109) **Stenobatyle cribrata** Casey

Several specimens of this very distinct species were taken at Temascaltepec, July, (Hinton and Usinger).

(110) **Muscidora tricolor** Thomson

A small series captured at Temascaltepec, July, (Hinton and Usinger).

(111) **Dorcadocerus barbatus** Olivier

A fine example of this beautiful Brazilian longicorn was captured at Oaxaca by Mr. Hinton. This is the first Mexican record for this species.

(112) **Dendrobias mandibularis** Serville

Taken in series at Temascaltepec, July, on a species of *Salix*, (Hinton and Usinger).

(113) **Trachyderes elegans** Dupont

Apparently common at Temascaltepec in July, (Hinton).

(114) **Megaderus bifasciatus** Dupont

One example, with the pale areas of the elytra much reduced, captured at Tejupilco, June, (Hinton and Usinger).

Explanation of Plate II

Fig. 1. *Acyphoderes sexualis* Linsley, ♂.

Fig. 1a. Terminalia of *same*.

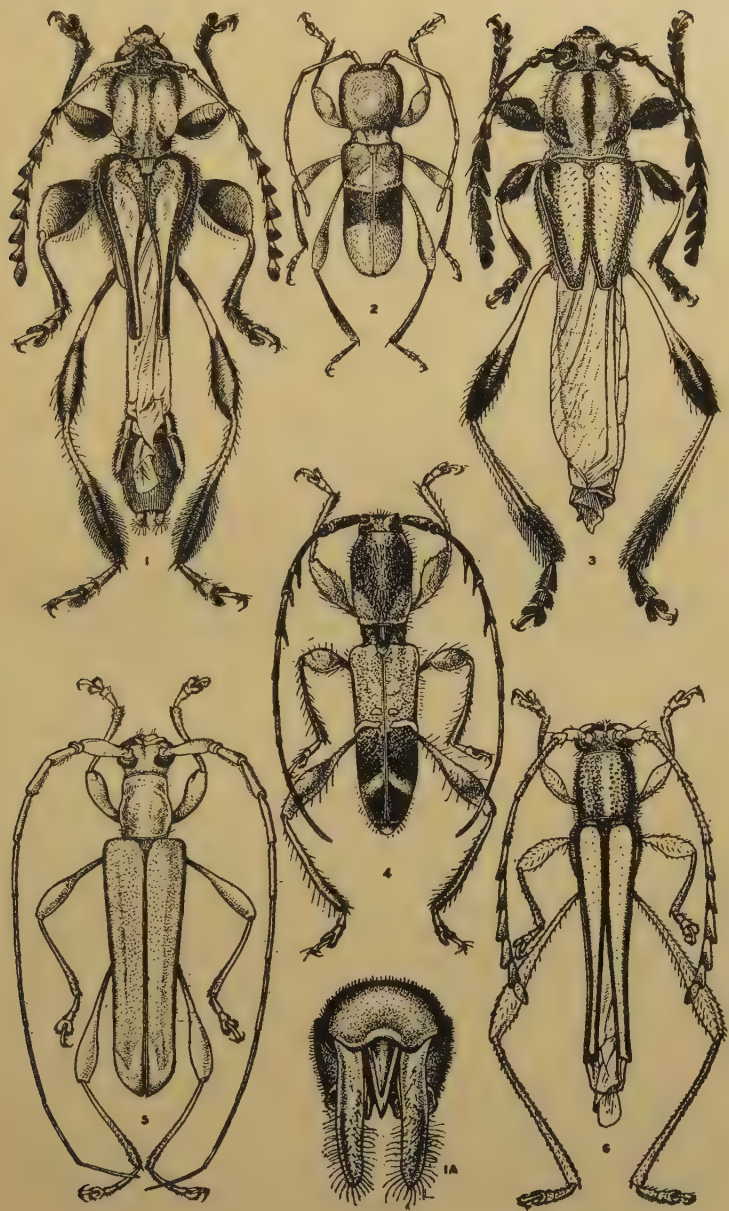
Fig. 2. *Clytoderus pygmaeus* Linsley.

Fig. 3. *Bromiades brachyptera* Chevrolat.

Fig. 4. *Eplophorus longicollis* Linsley, ♂.

Fig. 5. *Hypexilis longipennis* Linsley, ♀.

Fig. 6. *Odontocera carinicollis* Linsley.



LINSLEY — MEXICAN CERAMBYCIDAE

FIVE NEW THYSANOPTERA OF THE GENUS AEOLOTHRIPS

(AEOLOTHRIPIDAE)

BY J. DOUGLAS HOOD
University of Rochester

(Plate III)

The types of the four new species and one new variety described below are in the writer's collection. Paratypes of three of the new species have been deposited in the collection of The American Entomological Society.

Aeolothrips microstriatus new species (Pl. III, fig. 2)

Male (macropterous).—Length about 1.3 mm. Bicolorous, the body and legs (under low magnifications) brownish red, abdominal segments III–VIII yellowish or whitish; more closely examined, the integument of the darker body portions is seen to be brownish gray (that of the head and the last two abdominal segments darkest) and to be underlain with a nearly continuous bright red pigmentation which is densest in the thorax, somewhat less dense in the head and tibiae, nearly wanting in the dark abdominal tip, and absent from the tarsi, these last gray, the posterior pair darkest; antennae with segment I gray-brown and lightly underlain with red pigment, segments II–IX nearly uniform light gray, IV–IX just perceptibly darker, II and IV narrowly darkened with blackish brown at base, III with tip narrowly darkened with gray; wings of fore pair with a dark transverse band occupying the second fourth, distal portion of wing white excepting only a dark edging line (the ambient vein) interrupted at extreme tip of wing and a narrow faint cloud adjoining this line on each margin of wing in distal seven-eights, the extreme base of wing, scale, and ambient vein between scale and the cross band likewise dark; setae at tip of abdomen dark brown.

Head somewhat wider than long, of normal structure; antennae with segment III (102μ) less than one and one-tenth times as long as IV and about five times as long as greatest width, its sensorium about five times as long as wide and 0.36 as long as the segment itself; segment IV (95μ) with the sensorium curved and broadened apically, surpassing apex of segment, its length nearly half that of the segment itself; segment V (75μ) slightly more than twice as long as IV–IX together (35μ), its sense-cone attached at base only.

Thorax of normal form, pronotum smooth and shining, meso- and metanota exceedingly closely striate, the dark striae about one micron apart. Legs and wings of normal structure.

Abdomen of normal form, devoid of clasping organs and tergal processes; longest setae on segment IX measuring 170μ, the two dorsal pairs on X about 143μ.

Type.—♂; Juan Diaz, Panama. March 8, 1934. (James Zetek; in the flowers of an undetermined composite shrub [Hood no. 1089]).

The coloration of the body and fore wings is unique and distinctive, as is also the sculpture of the meso- and metanota. The latter feature is suggestive of the striations on the first abdominal tergum of *Aeolothrips albicinctus,* though very much finer and more closely spaced. In the absence of clasping organs it resembles such species as *A. albicinctus* Haliday, *A. mexicanus* Priesner, *A. vittipennis* Hood, and *A. brevicornis* Bagnall, but cannot profitably be compared further with them.

Aeolothrips kuwanaii var. **crucifer** new variety (Pl. III, fig. 5)

Female (macropterous).—Length about 1.8 mm. (distended, 2.2 mm.). Color and structure apparently identical with that of the typical form, save only the color of the fore wings; these with a complete dark cross-band occupying approximately the second fifth of wing, in addition to the dark vitta along posterior margin.

Measurements: Length 1.8 mm.; head, length 0.189 mm., greatest width 0.217 mm., width across eyes 0.200 mm.; eyes, length 0.070 mm., width 0.055 mm., interval (measured between edges of the most mesal facets) 0.091 mm.; posterior ocelli, diameter 0.019 mm., interval 0.042 mm., distance from anterior ocellus 0.029 mm.; prothorax, length 0.176 mm., width 0.266 mm.; pterothorax, width 0.385 mm.; fore wings, length 1.06 mm., greatest width 0.153 mm.; abdomen, greatest width 0.470 mm.; tergum IX, length 0.133 mm.; tergum X, length 0.123 mm.

Antennal segments:	1	2	3	4	5	6	7	8	9
Length (μ):	47	68	121	107	88	13	15	13	11
Width (μ):	43	32	29	30	30	20	17	12	7

Total length of antenna 0.485 mm.

Type.—♀; Korbel, California, July 28, 1927. (J. D. Hood, no. 710; in flowers of Elder, *Sambucus racemosa* Linné, P. A. Munz, det.).

Paratypes.—35 ♀, with same data as type. 17 ♀; Crater Lake National Park, Oregon. July 21, 1927. (J. D. Hood, no. 680, J.

C. Bradley, Henry E. Guerlac; on Tobacco Brush, *Ceanothus velutinus* Dougl., O. M. Freeman, det.).

There are apparently no structural differences between this and the typical variety, as a thorough study was made by means of a comparison eyepiece. At Korbel, California, both varieties were present in about equal numbers, while at Crater Lake National Park, Oregon, the variety *kuwanaii* was totally wanting. This species of *Aeolothrips* differs from all others which I have seen by the denser and longer pubescence on antennal segments four and five, which is very conspicuous because of its brown color.

The varietal name has reference to the dark cross, against a clear white background, which results when the wings are held together at rest.

Aeolothrips brevicauda new species (Pl. III, fig. 4)

Female (macropterous).—Length about 1.5 mm. (partially distended, 1.7 mm.). Color blackish brown, with a reddish cast due to the presence of bright red pigmentation in the fat-body of thorax and abdomen, that in abdomen principally subconjunctival, though a narrow band extends along each side and the tip has a pair of dense patches; similar pigmentation in head only around ocelli and at base of mouth-cone, lacking from all appendages save a faint patch in the membranous area at the apex of each femur and at the extreme base of each fore wing; all legs uniform blackish brown, the tarsi, particularly the fore pair (which are slightly yellowish), somewhat paler; antennae with segments I and II slightly paler than head, II with apex nearly white and base and sides narrowly nearly black; III pale grayish yellow, with distal tenth shading to nearly black; IV dark brown, somewhat paler basally, its pedicel rather abruptly nearly black; V–IX about concolorous with I; fore wings with the two usual dark cross-bands; extreme base of wing, including proximal fourth of anal area (scale), dark.

Head about 0.74 as long as greatest width, distinctly shorter than median length of pronotum, surface with distinct transverse anastomosing lines and the usual minute setae on occiput and vertex; cheeks distinctly swollen, the greatest width across them exceeding by less than one-tenth the greatest width across eyes. Eyes in dorsal aspect about 0.45 as long as head, distinctly shorter than their interval, distinctly prolonged posteriorly on ventral surface. Ocelli about one-half as wide as interval between posterior pair and narrower than distance between median and posterior ones. Antennae fully 2.6 times as long as head; segment I unusually short, less than half the length of II; III and IV with the usual

sense-areas much reduced in size, that on III only 18μ long, that on IV not hooked but of an elongate pointed-oval form, usually about 18μ by 7μ, extending slightly beyond dorsal margin of segment; V longer than IV, its sense-cone attached at base only, the pale spot thus circular. (Maxillary palpi three-segmented.)

Prothorax along median line of pronotum about 0.63 as long as greatest width, distinctly broader than head, somewhat widened posteriorly. Pterothorax about one and two-fifths times as wide as prothorax, of the usual form; mesonotum with the usual conspicuous dark anastomosing lines, these not closely spaced (4-5μ apart); metanotum with the usual subreticulation. Wings of fore pair broad, only five and one-half times as long as greatest width; venation normal. Legs normal.

Abdomen of the usual structure, but short, tergum IX shorter than half the width of head and less than one and one-fifth times as long as X; tergum I faintly subreticulate.

Measurements of holotype (♀): Length about 1.5 mm. (distended, 1.7 mm.); head, length 0.143 mm., greatest width 0.193 mm., width across eyes 0.182 mm.; eyes, length 0.065 mm., width 0.054 mm., interval (measured between edges of the most mesad segments) 0.075 mm.; posterior ocelli, diameter 0.017 mm., interval 0.035 mm., distance from anterior ocellus 0.020 mm.; prothorax, length 0.151 mm., width 0.238 mm.; pterothorax, width 0.339 mm.; fore wings, length 0.868 mm., greatest width 0.158 mm.; abdomen, width 0.426 mm., length of tergum VIII 0.080 mm., length of tergum IX 0.088 mm., length of tergum X 0.075 mm.

Antennal segments:	1	2	3	4	5	6	7	8	9
Length (μ):	27	62	87	66	68	19	19	17	13
Width (μ):	38	30	22	24	26	20	17	13	7

Total length of antenna 0.378 mm.

Type.—♀; Crater Lake National Park, Oregon. July 21, 1927. J. D. Hood, no. 681; on Gooseberry, *Ribes cereum* Dougl., O. M. Freeman, det.).

Paratypes.—3 ♀; with same data as type.

Though evidently allied to *A. fasciatus* and its relatives, this little species is nevertheless readily recognizable by the short abdomen (particularly the ninth tergum), the short broad wings, the short first and the long fifth antennal segments, and the small sensoria on the third and fourth antennal segments.

Aeolothrips oregonus new species (Pl. III, fig. 3)

Female (macropterous).—Length about 1.8 mm. (distended, 2.21 mm.). Color blackish brown, with a reddish cast, due to the presence of bright red pigmentation in the fat-body of the thorax and abdomen, that in abdomen principally subconjunctival, though a narrow band extends along

each side and the tip has a pair of dense patches; similar pigmentation in head only around ocelli and at base of mouth-cone, lacking from all appendages save a faint patch in the membranous area at the apex of each femur and at the extreme base of each fore wing; all legs uniform blackish brown, the tarsi, particularly the fore pair (which are slightly yellowish), somewhat paler; antennae with segments I and II slightly lighter than head, II with apex paler and base and sides narrowly nearly black; III pale grayish yellow, with pedicel more yellowish and distal tenth shading to brown: IV darker and more yellowish than III, its pedicel rather abruptly dark brown, its distal third or two-fifths shading to brown at tip and along sides; V–IX about concolorous with I; fore wings with the two usual dark cross-bands, but these bands connected along posterior margin of wing by a dark line exactly occupying the ambient vein, the intervening white area constituting about one-sixth the length of the wing and distinctly larger than the nearly circular white patch at tip; extreme base of wing, including proximal portion of anal area (scale), dark.

Head about 0.78 as long as greatest width, slightly longer than median length of pronotum, surface with a few faint lines of sculpture which are more distinct at sides, with the usual minute setae on occiput and cheeks; cheeks moderately arched, the greatest width across them about one and one-tenth times the width across eyes. Eyes in dorsal aspect about 0.43 as long as head, distinctly shorter than their interval, decidedly prolonged posteriorly on ventral surface. Ocelli less than half as wide as interval between posterior pair and distinctly narrower than distance between median and posterior ones. Antennae about two and four-fifths times as long as head; segments III and IV with the usual sense-areas much reduced in size, that on III only 20μ long, that on IV curved, not extending beyond dorsal margin of segment, and only 26μ in length and 5μ in width; sense-cone on V attached at base only, the pale spot thus circular. (Maxillary palpi three-segmented.)

Prothorax along median line of pronotum about 0.62 as long as greatest width, distinctly broader than head, somewhat widened posteriorly. Pterothorax about one and two-fifths times as wide as prothorax, of the usual form; mesonotum with the usual conspicuous dark anastomosing lines, these not closely spaced (4–6μ apart); metanotum with the usual subreticulation. Wings of fore pair about six and two-fifths times as long as greatest width; venation normal. Legs normal.

Abdomen of the usual form and structure; tergum I faintly subreticulate; tergum IX along median line nearly 0.7 as long as width of head and about one and one-quarter times as long as X.

Measurements of holotype (♀): Length about 1.8 mm. (distended, 2.21 mm.); head, length 0.159 mm., greatest width 0.204 mm., width across eyes 0.187 mm.; eyes, length 0.069 mm., width, about 0.056 mm., interval (measured between the most mesad facets) about 0.077 mm.; posterior ocelli, diameter 0.017 mm., interval 0.040 mm., distance from anterior

ocellus 0.023 mm.; prothorax, length 0.154 mm., width 0.248 mm.; pterothorax, width 0.350 mm.; fore wings, length 1.01 mm., greatest width 0.157 mm.; abdomen, width 0.420 mm.; tergum IX length 0.141 mm., tergum X, length 0.113 mm.

Antennal segments:	1	2	3	4	5	6	7	8	9
Length (μ):	33	63	124	95	77	17	13	13	11
Width (μ):	40	32	25	25	27	20	17	13	8

Total length 0.446 mm.

Type.—♀; Crater Lake National Park, Oregon. July 21, 1927. (J. D. Hood, no. 680, J. C. Bradley, Henry E. Guerlac; on Tobacco Brush, *Ceanothus velutinus* Dougl., O. M. Freeman, det.).

At the time the unique type was taken the species was not uncommon. In general appearance it is much like *A. fasciatus* (Linné), though in wing pattern it more closely approaches *A. melaleucus* Haliday. The details of wing coloration and the small antennal sensoria should, however, serve amply for its recognition.

Aeolothrips faurei new species (Pl. III, fig. 1)

Female (macropterous).—Length about 1.5 mm. (distended, 1.6 mm.). Color yellow, with all of head, last six antennal segments, mid and hind tibiae and tarsi and last three abdominal segments blackish brown, the head darkest; pterothorax orange-yellow, marked with blackish brown along posterior margin of mesonotum, anterior margin of metanotum, and along the suture between metathoracic epimeron and episternum, shaded with gray laterad of the similarly darkened first abdominal tergum; tergum and sternum of VII shaded with brown excepting at sides, darkest medially; sterna II–VII each with a nearly black line at base, these lines successively longer, wider, and darker on II–VI, that on VII shorter and even darker than the one on VI; antennal segments I–III yellow, I lightly brownish at sides, III dark brown in distal twelfth; all femora yellow, shaded with brown apically along outer surface; fore tibiae yellow, shaded on upper and lower surfaces with brown, so that in dorsal aspect they appear to be nearly uniform brown in color but lighter than middle and hind pairs; fore tarsi about concolorous with their tibiae; fore wings with the two usual dark cross-bands, extreme base of wing, including proximal fourth of anal area (scale) dark.

Head fully 0.8 as long as greatest width, distinctly longer than median length of pronotum, surface with faint transverse anastomosing lines and the usual minute setae on occiput and vertex; cheeks distinctly swollen, the greatest width across them exceeding by more than one-tenth the

greatest width across eyes. Eyes in dorsal aspect about 0.44 as long as head and about as long as their interval, distinctly prolonged posteriorly on ventral surface. Ocelli about one-third as wide as interval between posterior pair and only slightly wider than half the distance between median and posterior ones. Antennae only two and one-fifth times as long as head; segments III and IV with the usual sense-areas long and broad, that on III about 42μ long and about 0.4 the length of the segment, that on IV hooked at tip, usually about 50μ by 8μ and nearly two-thirds the length of the segment, extending considerably beyond dorsal margin of segment; V much shorter than IV, fully one and one-half times as long as VI–IX together, its sense-cone attached at base only, the pale spot thus circular. Maxillary palpi (three-segmented) stout and heavy.

Prothorax along median line of pronotum about 0.54 as long as greatest width, decidedly broader than head. Pterothorax about one and one-fifth times as wide as prothorax, of the usual form; mesonotum with faint anastomosing lines of sculpture which are not closely spaced; metanotum striate at sides, smooth at middle. Wings of fore pair rather slender, about six and one-half times as long as greatest width; venation normal. Legs normal.

Abdomen of the usual structure, tergum IX much longer than half the width of head and fully one and four-fifths times as long as X; tergum I with a few faint subtransverse lines near base.

Measurements of holotype (♀): Length about 1.5 mm. (distended, 1.6 mm.); head, length 0.159 mm., greatest width 0.196 mm., width across eyes 0.177 mm.; eyes, length 0.070 mm., width 0.053 mm., interval (measured between edges of the most mesad facets) 0.076 mm.; posterior ocelli, diameter 0.015 mm., interval 0.042 mm., distance from anterior ocellus 0.027 mm.; prothorax, length 0.132 mm., width 0.242 mm.; pterothorax, width 0.291 mm.; fore wings length 0.826 mm., greatest width 0.127 mm.; abdomen, width 0.372 mm., length of tergum VIII 0.086 mm., tergum IX 0.124 mm., tergum X 0.067 mm.

Antennal segments:	1	2	3	4	5	6	7	8	9
Length (μ):	27	51	101	78	57	12	9	8	7
Width (μ):	34	30	22	24	26	18	15	10	6

Total length of antenna 0.350 mm.

Type.—♀; Nylstroom (Waterberg), Transvaal. April 21, 1924. (J. C. Faure, no. T.26; on a species of *Albizzia.*).

Paratypes.—4 ♀; with same data as type.

A very distinct and beautiful species, and one which I take great pleasure in naming after my good friend, Dr. Faure, with whose careful and thorough methods of work I became familiar during his visit to the U.S.A. in 1932 and 1933. From *A. glori-*

osus, *A. aureus*, and *A. insularis*, the only other species of the genus which are predominantly yellow in color, it may readily be known by the nearly black head and by the various details of coloration of the legs and antennae in the above description.

Explanation of Plate III

(Drawn by Mrs. Philip T. Bassett, *née* Helen E. Rearwin.)

Fig. 1.—*Aeolothrips faurei* n.sp., ♀, *holotype;* minor setae largely omitted.

Fig. 2.—*Aeolothrips microstriatus* n.sp., left fore wing of ♂, *holotype.*

Fig. 3.—*Aeolothrips oregonus* n.sp., left fore wing of ♀, *holotype.*

Fig. 4.—*Aeolothrips brevicauda* n.sp., left fore wing of ♀, *paratype.*

Fig. 5.—*Aeolothrips kuwanaii* var. *crucifer,* n.var., left fore wing of ♀, *paratype.*

HOOD—NEW AEOLOTHRIPS

STUDIES IN THE ORTHOPTERA OF ARIZONA

PART I. NEW GENERA, SPECIES AND GEOGRAPHIC RACES

BY MORGAN HEBARD

(Plates IV-VIII)

Last year Dr. E. D. Ball, of the University of Arizona, who is preparing a very complete study of the Orthoptera of Arizona from an economic point of view, sent me his list of the species, compiled from the literature and the large number of determinations I have made for him since 1932. I was asked to make the necessary corrections and return this list to him as soon as convenient. This at the time seemed no serious problem and a beginning was made by checking from all of our material from the State, both recorded and as yet unreported.

The obstacles encountered were soon seen to be insurmountable without far more work than was originally contemplated. As a result it was decided to undertake the present studies, in which this paper which is part one, includes the descriptions of the two new genera, eleven new species and one new geographic race which are represented in the collections before us, numbering many thousands of specimens which have been assembled over the past twenty-eight years.

The second part of these studies will shortly follow, listing the two hundred and thirty species and eighteen races now known to be native in Arizona, the nine adventive species of Blattidae found there and noting that nine new species of the genus *Ceuthophilus* will shortly be described by Hubbell in his monograph of that genus.

In addition the type locality for each species described from Arizona will be cited, synonymy established involving names found in the literature for the State, all erroneous records subsequent to 1900 will be corrected and all records of species not previously known from Arizona will be given.

Blattidae

PSEUDOMOPINAE

Blattella vaga new species (Pl. IV, figs. 1 to 4.)

This insect is undoubtedly an introduction, occurring along the Gila and Colorado rivers in Arizona and California. We believe it is of Asiatic origin for we have before us a quite closely related though distinct (and unfortunately undescribed) species from southern India, whereas among the large series representing many African species at hand none show as close affinity.

Compared with the only other species established in North America, *Blattella germanica* (Linnaeus), the present insect is found to be distinguished by the slightly less reddish general coloration, particularly of the organs of flight which are faintly tinged with tawny olive instead of being faintly tinged with tawny. The male of *vaga* averages slightly smaller, this difference being more pronounced in the female, while in both sexes the tegmina are slightly broader and shorter. The heavier pair of longitudinal pronotal bars are very dark and sharply defined (in all of our series except one teneral female in which they are almost obsolete) and so are considerably more prominent than is usual in *germanica,* but the coloration of the head is particularly distinctive, being blackish brown from mesad between the eyes to the mouthparts, leaving only the latter, the cheeks, the dorsal half of the interocular space and the occiput buffy. The male has the specialization of the dorsal surface of the abdomen and of the supra-anal and subgenital plates much less intricate than in *germanica* and is best distinguished by these features, the supra-anal plate being chitinous and only moderately produced (instead of being subchitinous and very greatly produced) and the subgenital plate being almost symmetrical with small but moderately elongate styles (instead of having a highly asymmetrical subgenital plate with minute, very short styles).

Type.—♂; Phoenix, Arizona. April 18, 1933. (E. D. Ball). [Hebard Collection, Type no. 1269].

Head much as in *germanica,*[1] but not as elongate; palpi and pronotum similar. Tegmina only slightly surpass cercal apices. Wings as in *germanica,* with ulnar vein (in all examined) branched only once. Dorsal

[1] Described in Mem. Amer. Ent. Soc., No. 2, p. 57, pl. 2, figs. 6 to 9, (1917).

surface of abdomen with sixth tergite more produced than those preceding, its caudal margin mesad with a small concave area above twin deep pits on the seventh tergite, which latter further has its lateral portions reflexed; eighth and ninth tergites very narrow, the latter with margin alone visible; tenth tergite (supra-anal plate) symmetrically rounded-trapezoidal, chitinous and reaching as far caudad as the subgenital plate. Subgenital plate appearing almost symmetrical but with a moderate emargination below sinistral style, thence appearing weakly rounded-triangular produced and bearing a pair of small, very delicate, straight, simple styles which are separated by a distance slightly less than the length of one of them, each about three times as long as broad.

Allotype.—♀; same data as type but taken May 29, 1933. [Hebard Collection].

Very similar to male, slightly larger and more robust. Interocular space slightly wider. Dorsal surface of abdomen unspecialized. Supra-anal plate small, transverse, subchitinous, broadly rounded-triangular. Subgenital plate large, not produced, surface decidedly convex, distal margin nearly transverse.[2]

Coloration as noted above. In addition the wing veins are tinged with brown. The abdomen is margined with translucent buff, heavily suffused within these borders with dark brown and with narrow proximo-lateral dark brown markings on the tergites and broad meso-proximal suffused brown markings on the sternites, the intervening areas yellowish tawny. The limbs are buffy with femoral carinae all finely dark brown and dark brown flecks are also present at the bases of the tibial spines.

Immatures differ from those of *germanica* in coloration as do the adults, but in addition the abdomen appears transversely banded distad, the tergites being margined laterad and very narrowly distad with buffy.

	Length of body	Length of pronotum	Width of pronotum	Length of tegmen	Width of tegmen
♂					
Phoenix, Arizona. *Type.*	10.2 [3]	2.8	3.8	9.	3.
Phoenix, Arizona. *Paratype.*	9.2	2.8	3.7	8.9	2.9
Blythe, California.	9.7	2.5	3.1	8.	2.8
♀					
Phoenix, Arizona. *Allotype.*	8.5 [4]	2.9	4.	9.9	3.1
Mesa, Arizona.	9.5 [5]	3.2	4.3	11.	3.4
Blythe, California.	9.9	2.7	3.8	10.2	3.2

[2] The female is best distinguished by the features given here in the comparison with *germanica*.

[3] Abdomen extruded. Probably about 9.3 in natural position.

[4] Abdomen retracted, bearing ootheca.

[5] A very large specimen with abdomen retracted.

Ball observed that this species occurs only in local areas of rather extreme alkali conditions, but he found it present in the Salt River valley for at least forty miles.

Specimens Examined: 25; 8 males, 15 females and 2 immature individuals.

ARIZONA: Coolidge to Mesa, VI, 29, 1933, (R. H. Beamer), 2♂, 7♀, [Univ. of Kansas and Hebard Clns.]. Phoenix, IV, 18 and V, 29, 1933, (E. D. Ball), 5♂, 4♀, *type, allotype* and *paratypes,* 1 juv. ♂, 1 juv. ♀ (the immatures taken on the first date), [Hebard and Univ. of Arizona Clns.].

CALIFORNIA: Blythe, VII, 27, 1933, (R. H. Beamer), 1♂, 4♀, [Univ. of Kansas and Hebard Clns.].

MANTIDAE

VATINAE

PSEUDOVATES Saussure

This and the four other genera referred to the Group Vates by Giglio-Tos include species showing an even greater number of distinctive assemblages, but when these are analyzed it is found that the characters which have been given major generic significance merely occur in different combinations or are different in degree only. Particularly closely related are the genera *Vates* and *Pseudovates* and Giglio-Tos' key [6] is misleading, as it is too brief and does not enumerate the exceptions which certain species show. In spite of these exceptions, however, we believe that both should be recognized as valid. They may be separated as follows:

A. Dorsal fields of tegmina of male clear, glassy, immaculate; of female opaque, without transverse suffusions. Marginal fields of tegmina of female narrow, narrowing very gradually distad. Male antennae strongly pectinate.

Vates Burmeister, 1838

Genotype; *cnemidotus* Burmeister = *lobata* (Fabricius) [7]

AA. Dorsal fields of tegmina of male greenish subhyaline, with transverse suffusions of brown; [8] of female opaque, with similar suffusions.

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[6] Das Tierreich, Mantidae, p. 602, (1927).

[7] A South American species selected as genotype by Saussure and Zehntner in 1894.

[8] Except in the jamaican *cingulata* (Drury), in which these fields are clear, glassy, usually with, but sometimes lacking, transverse suffusions of brown.

Marginal fields of tegmina of female broader, showing conspicuous sudden distal narrowing.[9] Male antennae serrate-moniliform.[10]

Pseudovates Saussure, 1869

Genotype; *tolteca* (Saussure), by monotypy

These genera may be separated from the others of the group by the cephalic femora which lack a dorso-distal toothed lobe and the median and caudal limbs which bear lobes.

They are here discussed as a new species from Arizona is before us, nearest in relationship to two Mexican species, these being distinguished from all others of *Vates* and *Pseudovates*[11] in having the frontal process (a production of the inter-ocellar area) as long or longer than the width of the vertex. The lateral abdominal lobes are small but distinct in females, weaker in males. The three species may be separated by the following characters.

A. Frontal process shorter, no longer, or little longer, than width between eyes at its base.[12] Lateral fields of female tegmina much broader,[13] very suddenly and conspicuously narrowed distad.

B. Organs of flight caudate.[14] Lobation of median and caudal limbs moderately prominent.....*longicollis* (Stål)

BB. Organs of flight less caudate.[15] Lobation of median and caudal limbs very prominent.....*townsendi* (Rehn)

AA. Frontal process longer, much longer than width between eyes at its base.[16] Lateral fields of female tegmina much narrower, gradually narrowing, this becoming slightly stronger but not conspicuously so distad. (Organs of flight caudate. Lobation of median and caudal limbs moderately prominent.).....*arizonae* new species

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[9] Except in *arizonae* here described, in which these fields are not as broad, with distal narrowing only weakly indicated.

[10] Except in *peruviana* (Rehn) in which they are strongly pectinate.

[11] Except *Vates amazonica* (Westwood).

[12] In specimens before us, of *longicollis* ♂ 3.8, ♀ 3.6 (type female given as 3⅓); of *townsendi* ♀ (type) 3.3 mm.

[13] In specimens before us, of *longicollis* 3.1 meso-proximad and 3.1 meso-distad, of *townsendi* 3.8 meso-proximad and 4.8 meso-distad.

[14] Length of pronotum ♂ 22.3, ♀ 25.7 (Type given as 29½); length of tegmen ♂ 45., ♀ 38.3 mm.

[15] Type female; length of pronotum 26.7, length of tegmen 35. mm.

[16] All measurements for comparison are given in the description of this species.

Saussure and Zehntner recorded a female from Guadalajara, Jalisco, and a male from Cuernavaca, Morelos, as *Vates paraensis* (Saussure) giving a color figure of the former.[17] These specimens are apparently referable to *longicollis*. They are larger than the pair of that species from Cuernavaca, Morelos, in the Academy collection and indicate that considerable individual variation occurs, the female also having a longer frontal process. Giglio-Tos suggested in 1927 that *townsendi* is probably a synonym of *longicollis*, but we believe that the differences here noted are sufficient to warrant its recognition as distinct. Very rare in collections, additional material is needed to solve the problem conclusively.

Pseudovates arizonae new species (Pl. IV, figs. 5 to 7.)

1903. *Vates* sp. Caudell, Proc. Ent. Soc., Washington, v, p. 165. [Juv.; Madera Canyon, Santa Rita Mountains, Arizona.]

1905. *Vates townsendi* Caudell (in part,[18] not of Rehn, 1904), Jour. New York Ent. Soc., XIII, p. 83, pl. 3, figs. 1 and 2. [As above and ♂ Nogales, Arizona.]

1905. *Vates townsendi* Caudell (not of Rehn, 1904), Proc. U.S. Nat. Mus., XXVIII, p. 464, figs. 2 and 3. (Same material and figures as in last reference.)

1907. *Vates paraensis* Rehn (not of Saussure, 1871), Proc. Acad. Nat. Sci. Phila., 1907, p. 68. [♀; Baboquivari Mountains, Arizona.[19]]

Type.—♀; Baboquivari Mountains, Arizona,[20] Summer of 1906. (F. H. Snow). [Hebard Collection, Type no. 1274].

Important characters are given in the accompanying key. Size large (larger than our specimens of *longicollis*, but not as large as the type of that species or Saussure and Zehntner's female). Antennae small, very slender, joints moniliform. Frontal process very prominent, bifid, formed by two flattened attingent fingers which taper very feebly from near their bases to their rounded apices, with length decidedly greater than width

[17] Biol. Cent.-Amer., Orth., I, p. 195, pl. 6, fig. 1 and pl. 10, figs. 28 and 29.

[18] Mexican references correct.

[19] Rehn compared this specimen with the Mexican female he had recorded as *paraensis*, which we referred to *longicollis* in 1932 and have here discussed.

[20] This is the same specimen which Rehn recorded and which appears in Snow's list of that year as "*paracusis* Saussure". It was obtained by the author in an exchange of material with the University of Kansas in 1926.

between eyes there and appearing, though actually not, as long as the greatest cephalic width across the eyes. Facial scutellum with lateral margins thickly swollen and meso-dorsal spine prominent but rounded at apex. Pronotum elongate, surface (unlike the specimens before us of the very closely related species) minutely microscopically and not thickly denticulate, a medio-longitudinal carina weakly indicated on shaft and a low large bilobation at its caudal extremity, collar of subequal width, supra-coxal expansion prominent, lateral margins rather heavily denticulate throughout (more so than in the specimens before us of the very closely related species). Tegmina fully caudate, apices bluntly rounded at considerably less than a rightangle. Wings surpassing tegmina. Abdomen with latero-caudal angles of third, fourth and fifth sternites produced in small but conspicuous subfoliaceous lobes. Cephalic limbs much as in *longicollis* but surfaces more strongly though minutely denticulate, margins of coxae more strongly tuberculate and their ventral carina showing five larger darker tubercles. Median and caudal limbs with lobation similar but stronger than that of *longicollis,* much weaker than in *townsendi.* Median femora with a very broadly rounded low elongate lobe proximad on ventro-caudal carina and distad with a higher shorter rounded lobe on that carina and a similar but smaller lobe there on the two dorsal carinae; caudal femora similarly lobate but all these lobes considerably weaker, particularly the distal of the ventro-caudal carina. Median tibiae with a meso-proximal rounded lobe on the ventro-caudal carina and opposite it a longer rounded lobe on the dorso-caudal carina; on the caudal tibiae the homologous ventro-caudal lobe has almost disappeared but the dorso-caudal lobe is more prominent.

Allotype.—♂; Nogales, Arizona. June 14, 1903. (E. J. Oslar). [U.S. National Museum].

Very similar to female in ambisexual features. Size smaller, form more graceful. Antennae elongate, joints serrato-moniliform; each joint roundly produced ventro-distad, this gradually increasing and then more gradually decreasing in degree distad, greatest production making the meso-proximal joints slightly wider distad than long. Frontal process and spine of facial scutellum much as in female. Pronotum more slender with surface and margins showing even finer denticulations. Tegmina proportionately more ample, dorsal surfaces moderately glossy, marginal field moderately broad proximad but immediately narrowing more rapidly though evenly distad, tegminal apices similar. Wings surpassing tegmina. Abdominal lobes similar to those of female. Cephalic limbs with tuberculation and denticulation slightly weaker than in that sex. Median and caudal femora with lobation also similar but slightly weaker.

General coloration of female dark brown, limbs annulate with brownish buff; male decidedly paler but similarly marked. Dorsal surface of abdomen shining, tergites light orange yellow margined caudad with dark

brown, this widening mesad. Tegmina light dull green-yellow (possibly brighter and more green in life), with two large transverse blotches of dark brown on dorsal fields and flecks of the same distad in female; dorsal fields dull in female, moderately glossy in male and in that sex with the blotches lighter, more transverse and less extensive and the flecks paler and much fewer. Wings transparent, tips extensively embrowned, costal margin greenish buff, disk dark brown with transverse veinlets very finely buffy in female; clear hyaline with costal margin very pale greenish and only immediate tips embrowned in male.

Length of body ♂ 61.5, ♀ 75.; length of frontal process ♂ 5.8, ♀ 6.8; greatest width of head ♂ 5.8, ♀ 6.8; length of pronotum ♂ 22.8, ♀ 28.; width of pronotal supra-coxal expansion ♂ 4., ♀ 5.7; length of tegmen ♂ 40.8, ♀ 42.5; meso-proximal width of tegminal marginal field ♂ 2.1, ♀ 3.; meso-distal width of tegminal marginal field ♂ .3, ♀ 2.7; length of cephalic femur ♂ 13.4, ♀ 17.; length of caudal femur ♂ 15.2, ♀ 17.5 mm.

Specimens Examined: 4; 1 male, 1 female and 2 immature individuals.

ARIZONA:[21] Catalina Springs, 1 medium juv. ♀, [Hebard Cln.]. Ocotillo, VIII, 23, 1923, 1 medium large juv. ♀, [Hebard Cln.]. Nogales, VI, 14, 1903, (E. J. Oslar), 1♂, *allotype,* [U.S.N.M.]. Baboquivari Mountains, Summer of 1906, (F. H. Snow, 1♀, *type,* [Hebard Cln.].

ACRIDIDAE

EUMSTACINAE

The discovery of a new species from the mountains of southeastern Arizona was a distinct surprise to us, but the combination of characters which it shows is even more unexpected. In the two apparently most significant characters available for generic separation it agrees in one with *Morsea* Scudder and in the other with *Psychomastax* Rehn and Hebard.

It is possible that other yet unknown species from northwestern Mexico will clarify the generic concepts involved, but at present we feel obliged to recognize three genera, all far less distinct than we had believed the two previously recognized to be. These may be separated as follows.

[21] In 1905 C. R. Biederman wrote from the Huachuca Mountains that he had seen a very remarkable and strikingly colored insect, which he supposed to be a Mantid, which escaped capture. From his rough sketch we believe that it was almost surely an immature of the present species. During his long residence in southern Arizona he had never before seen such an insect nor did he find another.

A. Tarsal claws symmetrical. Fastigium not or but little projecting beyond eyes. Form comparatively robust. (Antennae with ninth segment toothed disto-ventrad. Caudal femora with apex armed with a medio-dorsal and dorso-lateral minute teeth, as are the genicular lobes.[22] Male cerci simple, styliform; subgenital plate lacking a linguliform process in its meso-dorsal section.)
Psychomastax Rehn and Hebard

AA. Tarsal claws highly asymmetrical. Fastigium more strongly projecting beyond eyes. Form more slender.

B. Antennae with ninth segment toothed disto-ventrad. Caudal femora with apex armed with only a medio-dorsal minute tooth and genicular lobes unarmed. Male cerci simple, styliform; subgenital plate lacking a linguliform process in its meso-dorsal section.....*Eumorsea* new genus
Genotype—*E. balli,* by monotypy

BB. Antennae with tenth segment toothed disto-ventrad. Caudal femora with apex armed with a medio-dorsal and dorso-lateral minute teeth, as are the genicular lobes. Male cerci falcate; subgenital plate with a linguliform process in its meso-dorsal section.
Morsea Scudder

Eumorsea balli[23] new genus and species (Pl. IV, figs. 8 to 11.)

The present insect is the largest of the Eumastacinae occurring in the United States and is very slender with very elongate and slender limbs. No species of the subfamily was hitherto known from east or south of the Arizona Plateau in this country.

Type.—♂; Ramsey Canyon above the box, Huachuca Mountains, Arizona. Elevation 6000 feet. July 20, 1933. (E. D. Ball; on Mexican Pinyon, *Pinus cembroides* Zucc.). [Hebard Collection, Type no. 1271].

Size very large, form elongate and very slender when compared with its allies. Apterous. Dorsal surface smooth, weakly polished, with a very few subobsolete tubercles and a low percurrent medio-longitudinal carina. Head with dorsal length distinctly less than that of pronotum; broadly convex ascendant to apex of fastigium; fastigium projecting beyond eyes slightly less than half its apical width, its apex truncate; fastigio-facial angle in lateral aspect acute angulate; face strongly retreating; frontal

[22] In *Psychomastax psylla robusta* Hebard alone these teeth are sometimes absent at the externo-dorsal point and on the external genicular lobes.

[23] Named in honor of the discoverer of this insect, Dr. E. D. Ball of the University of Arizona, the results of whose field work have aided us greatly in our studies of the Orthoptera of that State.

costa narrow and deep, narrowest between laterial ocelli, thence to apex of fastigium evenly widening with surface there convex between the lateral carinae. Eyes large, prominent, in depth only slightly greater than that of infra-ocular portion of the genae. Antennae short, with twelve joints, moderately thickened and depressed distad, tooth on ventral margin of ninth joint very small and weak.[24] Pronotum expanding ventro-caudad on lateral lobes; disk very slightly broader caudad than cephalad, lateral carinae practically obsolete, medio-longitudinal carina fine and percurrent, caudal margin of disk transverse with lateral portions exceedingly faintly convex and mesad with a very weak emargination; lateral lobes with ventro-cephalic angle very broadly convex, ventro-caudal angle very sharply rounded rectangulate. Apex of abdomen distinctly thickened. Supra-anal plate small and very narrowly shield-shaped, twice as long as broad, its dorsal surface concave.[25] Cercus simple, slightly surpassing supra-anal plate, curved feebly inward, slightly and evenly tapering to the rounded apex, cylindrical except that the inner surface is flattened. Subgenital plate composed of a pair of elongate triangular plates the apices of which are fused dorso-mesad, the portion of the plate between these much less chitinous. Limbs elongate and very slender. Caudal femora with apices armed as given in the accompanying key. Caudal tibial margins armed with (21) external and (18 and 19) internal (large) spines.[26] External tarsal claw very small, internal tarsal claw elongate and projecting nearly as far as the large arolium.

Allotype.—♀; same data as type. [Hebard Collection].

Very much larger than male. Frontal costa broader and not as deep. Eye in depth less than that of the infra-ocular portion of the genae. Antennae much shorter. Pronotum proportionately shorter, expanding definitely caudad both on disk and lateral lobes, the disk conspicuously broader with caudal margin transverse, its lateral portions broadly convex and mesad obtuse-angulate emarginate. Lateral lobes of pronotum with ventro-caudal angle rather broadly rounded rectangulate. Ovipositor jaws moderately prominent; dorsal pair almost straight, very faintly recurved, dorso-external margins with a few low coarse serrulations proximad; ventral pair with flange prominent and serrulate proximad and apices moderately decurved. Subgenital plate triangularly produced distad with margin convex mesad on each side and apex produced dorsad between the ovipositor valves in a spiniform process.

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[24] Practically obsolete in three male paratypes.

[25] Not as given in the original description of *Psychomastax psylla,* but the male genitalia actually agree very closely throughout with those of *Eumorsea balli.*

[26] One spine must be added to the total for the internal margin if the minute spine on the decided disto-internal rounded flange is not to be considered one of the spurs.

Sides shining blackish brown; occiput, pronotal disk and dorsal surface of abdomen clay color or light cinnamon buff to cinnamon, dark brown in one female only. Limbs in males reddish brown annulate with paler, the caudal femora with a dorso-proximal area and two annuli of the paler coloration; the females have the limbs decidedly darker, one with weakly and one with strongly annulate caudal femora. Ventral surface cinnamon buff.

The series before us shows little size variation, the type and allotype measuring as follows: length of body ♂ 11.8,[27] ♀ 21.2;[28] length of antenna ♂ 3.5, ♀ 2.7; length of pronotum ♂ 21.9, ♀ 2.7; length of cephalic femur ♂ 5, ♀ 4.7; length of median femur ♂ 4.1, ♀ 4.2; length of caudal femur ♂ 11.1, ♀ 13. mm.

Specimens Examined: 14; 7 males, 5 females and 2 immature individuals.

ARIZONA: Mount Graham, Pinaleno Mountains, VIII, 21, 1934, (E. D. Ball), 1♂. Ramsey Canyon above the box, Huachuca Mountains, 6000 feet, (E. D. Ball), VI, 11, 1933, 2 large juv. ♀; VII, 15, 1934, 2♀, *paratypes;* VII, 20, 1933, 5♂, 3♀, *type, allotype, paratypes.* Carr Canyon, Huachuca Mountains, (R. H. Beamer), 1♂, *paratype,* [Univ. of Kansas].

OEDIPODINAE

Leprus robustus new species

1900. *Leprus corpulentus* Scudder (in part not of Saussure, 1884), Psyche, IX, p. 75. [♂; Fort Whipple and forty miles east of Tucson, Arizona.]
1904. *Leprus elephas* Rehn (not of Saussure, 1861), Proc. Acad. Nat. Sci. Phila., LVI, p. 566. [♀; Reef, Arizona.]
1907. *Leprus elephas* Rehn (not of Saussure, 1861) Proc. Acad. Nat. Sci. Phila., LIX, p. 37. [♂, ♀; Carr Canyon, Huachuca Mountains, Arizona.]

This handsome insect is distinguished by its very robust form, proportionately fuller and larger head, less roughened pronotum with lateral lobes which do not widen ventrad, proportionately shorter organs of flight particularly in the female sex, tegmina not at all or very feebly maculate distad, wings with tips usually clear hyaline and disk (usually) light yellowish green varying to light greenish blue and caudal tibiae very pale glaucous, often buffy externally in females.

These features hold true only for typical material and the great amount of individual variation characteristic of all of the species of the genus, which must be reckoned with, is discussed below.

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[27] Abdomen curved upward, as is normal.

[28] Estimated as the abdomen is extruded—actual length 23.2 mm.

Close relationship is shown to *L. wheeleri* (Thomas), a more regularly and boldly striped insect with wing disk clear light yellow, but large series of that species before us from eastern New Mexico and Western Texas show no intergradation. The Mexican *L. elephas* Saussure is also closely related, material before us being even stockier, with proportionately even broader caudal femora, more finely tuberculate pronotum and wing disk light yellow.[29] Series from northern Mexico must be obtained to determine whether intergradation occurs.

Type.— ♀ ; San Bernardino Ranch, Cochise County, Arizona. Elevation 3900 to 3950 feet. September 24, 1922. (Rehn and Hebard). [Hebard Collection, Type no. 1276].

Size large, form very robust, surface comparatively smooth for the genus. Head very large and full, vertex broad and very feebly impressed, frontal costa broad dorsad and expanding between antennae thence narrower and soon disappearing ventrad, lateral foveolae represented by irregularly oval pits (varying in series from shallow to moderately deep). Antennae slender and moderately elongate. Pronotum with principal sulcus alone well indicated, medio-longitudinal carina very fine and obsolete mesocephalad; metazona twice (varying to less than twice) as long as prozona, with caudal angle acute; lateral lobes deep with cephalic and caudal margins vertical; surface of pronotal disk very finely, thickly and evenly beaded and with some larger nodes and short rugae, appearing quite smooth to the naked eye. Tegmina and wings showing definite reduction, extending beyond the apices of the caudal femora distinctly (rarely varying to scarcely) less than the pronotal length. Caudal femora short and very broad with dorsal and ventral flanges prominent, particularly the latter just before it subsides distad.

Allotype.— ♂ ; same data as type. [Hebard Collection].

Size much smaller and form much less robust than female, but more robust than males of the other Arizona forms of the genus. Head proportionately much the same but broad paired impressions of vertex more distinct though very shallow. Antennae proportionately more elongate. Pronotum definitely smoother, due to the subsidence of beading and much weaker nodes and rugae (often appearing smooth to the naked eye). Organs of flight showing weak reduction, surpassing caudal femora by slightly more than pronotal length (in males of the other Arizona forms of the genus usually decidedly more caudate). Caudal femora proportionately similar.

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[29] Comparison has been made with one male and three females from San Luis Potosi in the Academy collection.

General coloration depending on immediate environment, brown tinged with tawny or gray brown or sometimes with a decided pinkish tinge. Antennae usually darker. Head with face and occiput sometimes marked with very minute black specks. Pronotum often immaculate, often with large tubercles dark brown or black. Tegmina of the general coloration, crossed by two irregular darker bands beyond the second of which is an extensive darker area separated from it by a large transverse pale buff marking and sometimes invaded beyond by one, very rarely by two, small pale areas; apices transparent, immaculate but tinged with the ground color; humeral vein light buff to near proximal portion. Wings with disk dull opaline green, sometimes pale veronese green (more yellowish), very rarely pale nile blue, always shading to nile blue at base; wing band broad, dark brown, widest across the area of the wing tip and showing only weak external indentation at the juncture of the anterior and posterior fields; wing tip immaculate, very rarely with a suffused brown spot (this indentation is usually more decided and the wing tip usually has one or two suffused brown areas in the other Arizona forms of the genus). Abdomen buffy, extensively tinged with blue dorso-proximad. Caudal femora with a pre-genicular annulus slightly paler than the other portions, preceded by a vague and often incomplete transverse dark band, the dorso-external margin with two darker areas preceding that, which rarely are vaguely continued on the external pagina as a darker suffusion or a group of dots; internal surface blue-black in nearly proximal half and a transverse band of the same beyond, the other portions light buffy with genicular area marked with brown. Caudal tibiae very pale glaucous with proximal third, apex and feet buffy, external surface usually also buffy in females.

In the characters most useful in distinguishing *robustus* the following variation must be considered. Though the males are distinctly more robust and broader than those of *L. cyaneus* Cockerell, this is not always true for females which, in atypical *cyaneus* from some of the localities in southern Arizona where both species occur, are quite as large, the head, however, averaging proportionately not as large, the pronotum not as broad and as a rule rougher. In *robustus* the tegmina and wings are normally shorter and less maculate distad; rare individuals show, however, sufficient variation in these features to prevent correct specific assignment without consideration of the other diagnostic characters. In typical *robustus* the wing disk is light yellowish green and in typical *cyaneus* rich blue, but both species show very wide variation in this feature if material from all portions of their range is considered. Although the pronotal lateral lobes

are never convexly produced ventro-caudad in *robustus,* such production in *cyaneus* and its allies is variable in degree and very rarely obsolete in individuals from large series taken at points coincident in their distribution. Usually *robustus* may be distinguished at a glance from *cyaneus* and its allies by the broad short caudal femora with wide dorsal and ventral flanges, but rare individuals have these limbs no broader than in some of the atypical material of *cyaneus.* In typical *robustus* the caudal tibiae are largely very pale glaucous and in typical *cyaneus* they are largely deep blue, but again this difference does not hold in atypical *cyaneus* where the ranges of the two species coincide.

	Length of body	Length of pronotum	Greatest width of pronotal disk	Length of tegmen	Length of caudal femur	Greatest width of caudal femur
♂						
Franklin Mountains, Texas.	27.8	9.1	6.4	30.	17.	6.1
Lordsburg, New Mexico	28.8 to 30.	8.2 to 8.7	5.9 to 6.7	27.7 to 30.7	16.3 to 17.4	5.7 to 6.1
San Bernardino Ranch, Arizona. *Paratypes.*	29. to 35.	7.2 to 8.8	5.2 to 6.4	24.7 to 29.6	15.3 to 17.1	5.2 to 6.
Madera Canyon, Santa Rita Mountains, Arizona.	29.8 to 32.8	7.4 to 8.8	5.3 to 6.3	24.6 to 30.6	15. to 18.1	5.7 to 6.2
♀						
Hachita Grande Mountains, New Mexico.	42.2 to 47.8	11.1 to 12.2	8.7 to 8.9	35.6 to 38.7	21.7 to 22.2	7.3 to 7.8
San Bernardino Ranch, Arizona. *Paratypes.*	41.8 to 50.	10.9 to 12.3	8.7 to 9.1	33.8 to 37.	20.7 to 20.9	7. to 7.7
Schaeffer Canyon, Baboquivari Mountains, Arizona.	42.8 to 49.7	10.3 to 12.8	7.8 to 9.4	33.3 to 38.2	19.3 to 23.2	7.3 to 8.1

Specimens Examined: 222; 119 males, 100 females and 3 immature individuals.

TEXAS: Franklin Mountains near El Paso, 4600 feet, IX, 15, 1912, (Rehn and Hebard; on rather bare slopes with much Lecheguilla, few grasses and various desert plants), 1♂.

NEW MEXICO: Lordsburg, 4300 feet, X, 15, 1910, (R. and H.; occasional in scanty yellow grass at foot of hill), 5♂, 2♀. Canyon northwest of Hachita Grande Peak, 5300 to 5800 feet, IX, 27, 1922, (R. and H.; few in scanty grass among thick brush), 6♂, 6♀.

ARIZONA: Rock House Canyon, Dos Cabezos Mountains, 4200 feet, X, 14, 1910, (R. & H.; on bare rocks just below extensive patches of *Dasylirion*), 3♂, 2♀. San Bernardino Ranch, Cochise County, 3900 to 3950 feet, IX, 24, 1922, (R. & H.; on plain covered with rounded chunks of lava with much Creosote Bush, Ocotillo and a mimosa and areas of sparse yellowish grasses), 18♂, 11♀, *type, allotype, paratypes,* 1 large juv. ♂. South end of Perillas Mountains, 4500 feet, IX, 24, 1922, (R. &. H.; gravelly hills with same cover as above), 1♂. Mule Pass in Mule Mountains, 6100 feet, IX, 23, 1922, (M. Hebard; on rocky slope), 1♂. Don Luis, 5100 feet, (M. Hebard; very scarce on gentle slopes with yellow grass and much semi-desert vegetation), 2♂. Benson, 4100 feet, X, 13, 1910, (R. & H.; on mesa in patches of short dry yellow grass), 8♂, 2♀. Oracle, IX, 8, 1932, (E. R. Tinkham), 2♂. Santa Catalina Mountains, 4000 to 5000 feet, IX, 29, 1922, 2♀. Lower Madera Canyon, Santa Rita Mountains, 4600 feet, IX, 26, 1924, (M. Hebard; on hillside among rock fragments and short grass), 3♂. Madera Canyon, Santa Rita Mountains, IX, 10, 1932, (E. R. Tinkham), 1♂. Santa Rita Mountains, VIII, 29 to IX, 24, 1919 to 1924, 1♂, 2♀, [Univ. of Ariz.]. Flux, Alum Canyon, Santa Cruz County, 3900 feet, IX, 25, 1924, (J. A. G. Rehn; at foot of hill on broken rock), 2♂, 3♀. River Camp above Nogales, 3500 feet, IX, 20, 1922, (R. & H.; moderate numbers in short green but dry grass; an unwieldy insect, slow in its movements and easy to collect), 7♀. Six miles northeast of Nogales, 4000 feet, IX, 20, 1922, (R. & H.; moderately common on rolling hilltops), 11♂, 4♀. Nogales, X, 11, 1918, (J. A. Kusche), 1♂. Calabasas Canyon, Santa Cruz County, 3750 feet, IX, 23, 1924, (R. & H.; in area of gramma grass dotted with mesquite), 3♀. Foothills of Pajaritos Mountains, 4400 feet, IX, 21, 1922, (R. & H.; small numbers on summits of rolling hills), 2♂. Austerlitz, Tumacacori Mountains, 4325 feet, IX, 21, 1924, (R. & H.; on oak dotted hills), 2♀. Two miles north of Oro Blanco, foothills of Tumacacori Mountains, 3800 feet, IX, 21, 1924, (R. & H.), 1♀, 1 juv. ♀. Tumamoc Hill, Tucson Mountains, 2400 to 3092 feet, X, 3 and 4, 1910, (R. & H.; usually on exposed areas of rocky soil in dry yellow grass with many desert shrubs present), 4♂, 5♀. Roebles Pass, Tucson Mountains, 3000 feet, X, 11, 1910, (R. & H.), 1♀. Sahuaro plain between Tucson and Coyote Mountains, X, 5, 1910, (R. & H.; in dry yellow grass among composites, much Mesquite, some Creosote Bush), 6♂, 3♀. Palo Alto Rancho, Altar Valley, 3000 feet, X, 6, 1910, (R. & H.; in short yellow grass on gravelly soil among mesquite), 2♂, 1♀. Espinosa Rancho, Altar Valley, 3200 feet, X, 9, 1910, (R. &. H.; in wash with much Mesquite and low yellow grass), 3♀. Four miles north of Buenos Aires Well, Altar Valley, 3850 feet, IX, 20, 1924, (R. & H.), 2♂, 1♀. Santa Margharita Rancho, Altar Valley, 4850 feet, IX, 20, 1924, (R. & H.; on low gravelly ridges with fine green grass and cat-claw), 1♂. Sycamore Canyon, Babo-

quivari Mountains, 3400 to 5800 feet, X, 6 and 9, 1910, (R. & H.; on plain and hillsides up to oaks, most plentiful on bench), 30♂, 34♀. Schaeffer Canyon, Baboquivari Mountains, 4500 to 4600 feet, IX, 18 and 19, 1924, (R. & H.; few on hillsides, one on bare rock, one on gravelly area beside wash), 5♂, 2♀. Mount Mildred, Baboquivari Mountains, 5600 feet, IX, 19, 1924, (M. Hebard; on steep slopes), 1♂, 1 juv. ♀.

Atypical Material

The following sixty-one specimens differ from typical *robustus* in having the average form slightly but definitely less robust, the organs of flight conspicuously more caudate and the wing disk conspicuously bluer, ranging from very pale methyl blue, through lumiere blue (normal) to nile blue.

Colorado: Cedar Creek, Montrose County, 6900 feet, IX, 1, 1921, (M. Hebard; in grassy area on hillside, only one seen), 1♂.[30]

New Mexico: Farmington, 5300 to 5500 feet, IX, 6 and 7, 1921, (R. & H.; common on boulder-strewn hillsides with quite a little short green grass and low plants), 43♂, 17♀.

Specimens from Grand Junction and Delta, Colorado,[31] are also before us which may represent a northern geographic race of *robustus,* but which may show merely the extremes of variation away from the normal. We feel that more material is needed to determine which is the case. They average even less robust, with tegmina and wings maculate distad (in the four males but not in the two females) and have the wing disk ranging from pale methyl blue to deep nile blue (as deep as is normal in typical *cyaneus*).

CYRTACANTHACRINAE

Perixerus gloriosus new species (Pl. V, figs. 1 to 3.)

This, the fifth species of a genus hitherto known only from Mexico, is again a distinctive insect, widely separated from the others not only by its very unusual coloration but also by structural characters.

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[30] Recorded as *Leprus* sp. near *interior* by Hebard in 1929. The specimen from Carbon Junction, Colorado, then so recorded represents *L. cyaneus* Cockerell.

[31] Recorded as *cyaneus* by Gillette in 1904 and as *Leprus* sp. near *interior* by Hebard in 1929.

It is apparently slightly nearer *P. laevis* Rehn than the others, agreeing in the vertex which shows very weak (but stronger) impression only proximad and in being very weakly hirsute.

The caudal margin of the pronotal disk is, unlike in the other species, very faintly obtuse-angulate produced and the tegmina are decidedly more approximate.

Type.—♂ ; south slopes of Atascosa Peak, Pajaritos Mountains, Arizona. Elevation 5500 to 6200 feet. September 21, 1922. (M. Hebard). [Hebard Collection, Type no. 1272].

Size and form medium for the genus, but moderately slender. Interocular space moderately broad, slightly broader than in *laevis* (from females seen to be broader in the present species than in *P. hirsutus* Hebard but decidedly narrower than in *P. variabilis* Rehn. Fastigium short, blunt, declivent, very feebly impressed proximad. Frontal costa expanding very slightly to between antennae where it is slightly widest, thence narrowing to juncture with fastigium; its surface flat, impressed about and below median ocellus. Carina of face blunt but distinct like lateral carinae of frontal costa, infra-ocular sulcus very decided. Pronotum rather coarsely pitted, rounding into lateral lobes without trace of lateral carinae, transverse sulci decided as in *variabilis,* deeper than in *laevis,* medio-longitudinal carina very weak and present only on metazona, caudal margin of disk distinctive as described above. Tegmina represented by fairly large ovate pads, subattingent (in type, varying in paratypes from briefly separated to overlapping), larger and broader than in *laevis,* venation prominent and regular. Prosternal spine prominent, blunt, elongate conical. Furcula represented by two small equilateral projecting triangles. Supra-anal plate triangularly shield-shaped, broader than long, lateral margins feebly concave in median half; lateral portions rather strongly concave to apex of plate, other portions of surface elevated except for a meso-proximal impression. Cerci simple, styliform, slightly over twice as long as basal width, tapering to the acute apices which are scarcely decurved (moderately decurved in *laevis*). Penis (Pl. V, fig. 2) projecting a much shorter distance than in *laevis.* Subgenital plate with a small but decided apical tubercle. Cephalic and median tibiae thickened but hardly at all bowed. Caudal tibiae with eight spines on each margin. Caudal metatarsus rather short, very slightly shorter than combined length of the two succeeding joints. Arolium large and elongate.

Allotype.—♀ ; same data as type. [Hebard Collection].

Larger and more robust than male. Interocular space and fastigium broader. Caudal margin of pronotum similarly very faintly obtuse-

angulate produced. Tegmina separated by a moderate interval, (varying to attingent in paratypes). Ovipositor valves short with apices rather strongly curved.

General coloration clear light green (fading in dried specimens to greenish yellow except on tegmina), except as follows. A broad band from apex of vertex to caudal margin of pronotum, cephalic and median femora and tibiae and all of caudal femora except dorsal carina, genicular lobes and ventro-internal carina, very bright jasper red (almost a light scarlet). Antennal joints very extensively suffused with brown. Caudal tibiae glaucous.

This coloration is very distinctive. Nearest approach is shown by *Hesperotettix speciosus* (Scudder) in which the colors are all much less brilliant, the red much less extensive and the caudal tibiae are green.

Immatures differ in having the red less brilliant, the entire dorsum and the external pagina of the caudal femora extensively marked with shining dark brown.

The extremes in the series before us measure as follows: length of body ♂ 16.7 to 18.7, ♀ 20.5 (abdomen retracted) to 26.7 (abdomen moderately extruded); length of pronotum ♂ 4. to 4.7, ♀ 5.2 to 6.3; total caudal width of pronotum ♂ 3.3 to 4., ♀ 4.8 to 5.8; exposed length of tegmen ♂ 3.8 to 4.3, ♀ 4.3 to 5.4; width of tegmen ♂ 2.2 to 2.8; ♀ 3.2 to 4.; length of caudal femur ♂ 10. to 10.5, ♀ 12.3 to 13.3 mm.

All of the adults are considered paratypes. The series was secured at the same locality as was the type by Rehn and Hebard, six males and four females on September 21, 1922; three males, three females, six immature males and seven immature females on September 21 and 22, 1924. One immature female was taken, probably at the same locality, on August 31, 1927, by J. C. Bradley and belongs to Cornell University.

The series was found over an area not more than a mile in diameter on the south slopes of Atascosa Peak from 5500 to 6200 feet, where these slopes pitch steeply down into Bear Valley and toward the nearby Mexican line, in the thick low covering of grass and a variety of plants. In life the coloration was remarkably rich and brilliant. The field notes read "The food plant grows in small scattered and widely separated patches on the steep mountain slopes. I found as many as three immature individuals in one plant, perched up in it just like *Poecilotettix pantherinus* (Walker). Like that species they also quickly abandoned their bush when approached. They leap fairly vigor-

ously for such soft-bodied grasshoppers, but their other movements are not rapid and they seem stupid."

Comparisons have been made with the female types of *laevis* and *variabilis* and males of the former species (males of which alone are known of the formerly described species) in the Academy Collection and female paratypes of *hirsutus* in the author's collection.

TETTIGONIIDAE

PHANEROPTERINAE

Insara tessellata new species (Pl. V, figs. 4 and 5.)

This delicately beautiful katydid is much nearer the recently described *I. juniperi* Hebard from New Mexico [32] than any of the other previously known species. In size and form it is very similar and its general appearance on first glance looks much the same. The coloration and pattern, on further examination, is however seen to be very different; the tegmina with stridulating field of male (anal field of female) purplish brown excepted mesad and sutural margin narrowly to broadly that color, the pale areas toward that margin (usually) as broad as long and as large as the intervening green (or brown in the brown phase) areas and the other portions of the tegmina less evenly colored, appearing more definitely tessellate. The abdomen and caudal femora are also marbled with a paler shade, the former showing everywhere minute microscopic purplish dots and the latter with decided dark flecks along their pale ventro-external margins.

These and the shorter broader dorsal markings of the tegmina compose a strongly spotted and tessellate pattern actually very unlike the more solidly colored *juniperi* in which the tegmina particularly differ in showing a definite herring-bone type of marking.

In addition the present species has the lateral lobes of the pronotum very definitely longer than deep (these proportions equal in *juniperi*) and the limbs are noticeably more elongate and proportionately quite as heavy. The male genitalia are very

[32] Proc. Acad. Nat. Sci. Phila., LXXXVII, p. 70, (1935).

similar, differing only in the convexity of the inner margin of the cerci at the apical tooth being more decided (but this feature is subject to some individual variation as it is slightly more pronounced in the males from Prescott than the others).

Type.—♂; Wheeler Canyon, Hualapai Mountains, Arizona. Elevation 5000 feet. (O. C. Poling). [Hebard Collection, Type no. 1281].

Size medium small for the genus, form rather robust, the abdomen in life being short and extremely inflated. Head as in *juniperi,* slightly broader than in *I. elegans* (Scudder); eye prominent, elongate, nearly oval, almost vertical; vertex similar, declivent, this strongest proximad, its dorsal surface very narrow and sulcate. Pronotum of medium length and definitely longer than in *juniperi,* very weakly (individually varying to weakly) sellate, lateral carinae coarsely and weakly indicated, cephalic margin very weakly concave, caudal margin broadly convex with flattening of the convexity shown on each side (often to a less degree than in *juniperi*); lateral lobes with greatest depth distinctly less than greatest width, the humeral sinus large, deep, concave, its margins perpendicular to each other, below this the ventro-caudal portion is roundly produced caudad, that section occupied by a very large convex callosity which is even broader than in *juniperi.* Tegmina (particularly stridulating field) as in *juniperi;* narrow with apices rounded, marginal field narrowing less rapidly than in *juniperi* but similarly disappearing mesad. Wings extending well beyond tegmina. Dorsal abdominal tergites pinched meso-distad but not produced. Disto-dorsal tergite with a large meso-distal depressed area. Supra-anal plate small, triangular. Cerci tapering, slightly curved but definitely bent inward mesad, just before apical tooth strongly impressed dorsad, the inner margin there strongly convex and rounding into the small acute triangular apical tooth, which is directed dorsad and slightly distad. Subgenital plate with short non-articulate styliform appendages and with distal margin transverse but bluntly produced mesad. Limbs comparatively heavy and moderately elongate for the genus. Cephalic tibiae enlarged proximad with both large tympana apert, narrowing gradually distad of these. Genicular lobes of cephalic and median femora minutely bidentate. Ventral femoral margins unarmed. Very important diagnostic characters are shown by the color pattern.

Allotype.—♀; Boulder Spring, Mojave County, Arizona. July 14, 1920. (O. C. Poling). [Hebard Collection].

Very similar to male in ambisexual features but larger. Sellation of pronotum even weaker. Ovipositor comparatively large, deep, particularly at base where it is strongly bent dorsad, margins beyond converging very

weakly then curving to apex, dorsal margin armed with minute triangular teeth which increase in size distad, ventral margin so armed only distad; lateral surfaces of dorsal valves microscopically acutely tuberculate, of ventral valves showing microscopic vertical ridges dorsad and weaker more irregular ones mesad, these becoming general distad.

General coloration bright cedar green, the face and sides slightly paler green; markings as follows. Eyes wood brown. Antennae light green, distad with irregular annuli, some very short and dark brown, others longer and light brown. Head with all of vertex, vertical facial carinae broadly, upper portion of clypeus, ventro-caudal portions of cheeks and postocular bar buffy, these markings vague or obsolete in all poorly preserved specimens. Pronotum with lateral margins of disk faintly indicated in buffy cephalad, this marking becoming broader and green caudad, caudal margin laterad very narrowly whitish, almost all of metazona preceding this rusty brown; lateral lobes showing a few microscopic olivaceous dots and convex callosity white. Tegminal marking distinctive as described above; microscopic black dots in discoidal and marginal fields very numerous, more numerous than in *juniperi*. Male stridulating field purplish brown except mesad where it becomes green, its caudal portion and the sutural margin rich purplish brown; female anal field and sutural margin similar except that the green in the former is more extensive. Abdomen rich green, everywhere thickly supplied with microscopic purplish dots and marbled with buffy ventro-laterad, proximal tergites with a broad dorso-lateral band of buffy the margins of which are very irregular, the third tergite with that band tinged with purplish in dorsal portion, the fourth there similar and with a very large shining dark brown blotch meso-caudad. Ventral sternites green with a broad shining yellow buff median line and marbling of the same laterad, everywhere thickly supplied with microscopic purplish dots. Ovipositor red brown at apex. Cephalic and median limbs extensively but very vaguely annulate with whitish green, with numerous minutely microscopic dots of olivaceous and with small pale brownish flecks along the ventral margins; caudal femora green, finely marbled with greenish white and pale greenish brown, the pale ventral margins with conspicuous flecks of dark brown; caudal tibiae with a broad inconspicuous annulus of whitish green followed by other even more vaguely paler annuli and sometimes with exceedingly faint traces of brownish suffusions.

A brown phase in which the general coloration is ochraceous tawny becoming buffy citrine on the tegmina, with similar markings to those of the green phase buffy, is represented by a male from Prescott and a female from Sawmill Canyon.

	Length of body	Length of pronotum	Length of tegmen	Projection of wing beyond tegmen	Length of caudal femur	Length of ovipositor
♂						
Prescott, Ariz. *Paratype.*	14.3	3.8	20.2	3.6	17.8	——
Prescott, Ariz. *Paratype.*	17.	3.8	23.	3.1	17.8	——
Wheeler Canyon, Hualapai Mts., Ariz. *Type.*	20. [33]	3.9	24.7	1.7	19.1	——
♀						
Sawmill Canyon, Hualapai Mts., Ariz. *Paratype.*	19.5	4.	26.7	3.7	21.7	6.2
Boulder Springs, Ariz. *Allotype.*	18.3 [34]	4.	25.2	2.8	20.2	5.8
Kingman, Ariz. *Paratype.*	18.1 [34]	4.1	26.	3.3	23.3	5.8

Specimens Examined: 11; 8 males and 3 females.

ARIZONA. Prescott, VII, 29, 1933, (R. H. and J. D. Beamer), 5♂, *paratypes,* [Univ. of Kansas and Hebard Cln.]; VIII, 24, 1917, (J. A. Kusche), 1♂, *paratype.* Yavapai County, VIII, 9, 1927, (R. H. Beamer), 1♂, *paratype.* Sawmill Canyon, Hualapai Mountains, IX, 19, 1919, (O. C. Poling), 1♀, *paratype.* Wheeler Canyon, Hualapai Mountains, 5000 feet, (O. C. Poling; on oak brush), 1♂, *type.* Kingman, IX, 25, 1919, (O. C. Poling), 1♀, *paratype.* Boulder Spring, Mojave County, VIII, 14, 1920, (O. C. Poling), 1♀, *allotype.*

Arethaea coyotero new species (Pl. V, fig. 6; pl. VI, figs. 1 and 2)

1914. *Arethaea brevicauda* Rehn and Hebard (in part not *Dichopetala brevicauda* Scudder, 1900), Trans. Amer. Ent. Soc., XL, p. 172 to 175. [♀; Crestline, Nevada.)

This species is peculiar to southern Nevada and northwestern Arizona, whereas *A. brevicauda* (Scudder) occurs there and also in southern California.

This interesting new species occupies a position between *A. semialata* Rehn and Hebard and *A. gracilipes* (Thomas) but shows nearer relationship to the latter, the specialization of the first abdominal tergite being very similar to that of *gracilipes gracilipes.* The organs of flight are strongly caudate in the males, very greatly reduced in the females. It further differs from *gracilipes* in having the females decidedly more robust than the males, the pronotum with caudal margin of disk broadly convex and the male cerci have the inbent apical portion formed by a rather slender tooth which is no wider proximad than mesad.

[33] Abdomen extruded.

[34] Abdomen retracted.

Females are spearable from the strongly brachypterous females of certain other species of the genus by the much longer ovipositor which curves gradually (and is not bent) dorsad.

TYPE.—♂; Prescott, Arizona. Elevation 5400 feet. August 20, 1917. (O. C. Poling). [Hebard Collection, Type no. 1277].

Size small, form very elongate. Head much as in *gracilipes*[35] but not quite as deep; eye prominent, infra-ocular portion of genae not as deep. Margins of pronotum simple, not at all nodose. Pronotum moderately inflated, sub-bullate across the lateral lobes, sellate; caudal margin of disk broadly convex, showing no angulation; lateral lobes rather shallow, humeral sinus shallow and concave, convex callosity very large and decidedly inflated. Tegmina elongate and narrow, appreciably narrower meso-proximad than meso-distad, not darkened at sutural margins; stridulating field small, scarcely produced at apex of stridulating vein. Wings strongly surpassing tegmina, extending decidedly beyond apices of caudal femora. Abdominal tergites with caudal margins laterad showing very weak crenulation (individually varying to simple[36]). Abdomen with first tergite (following median segment) specialized meso-caudad, this process moderately high, about as high as its basal width, its apex bulbous, its cephalic face thickly hirsute, its caudal face deeply concave; ultimate tergite transverse, surface showing extensive weak concavity meso-distad, distal margin broadly and very weakly convex laterad and broadly and very weakly concave mesad; supra-anal plate below this tergite, vertical, its caudal surface concave, its form rectangulate, distinctly broader than long, with disto-lateral angles rounded. Cercus stout, gradually tapering and faintly incurved to apical portion which is strongly bent inward, chitinous, flattened, slender, as narrow mesad as proximad with apex itself acute. Subgenital plate broad, moderately elongate, the distal margin very deeply concave between the moderately elongate slender styliform processes. Limbs very elongate and very slender. Femora with apices not produced dorsad; genicular lobes of cephalic and median bispinose, of caudal unispinose.

Allotype.—♀; same data as type but taken July 18, 1917. [Hebard Collection].

Decidedly more robust than male with decidedly shorter and slightly heavier limbs. Pronotum very feebly sellate and convex callosity narrower and far less inflated. Tegmina represented by very short convex overlapping pads, their venation distinct, outline rounded in dorsal aspect but

[35] See Rehn and Hebard, Trans. Amer. Ent. Soc., XL, p. 122, (1914).

[36] Except in the Nevada male, in which these margins are conspicuously crenulate.

apices minutely but sharply angulate produced. Ultimate tergite small, transverse, rectanglar, the semicircular supra-anal plate hinged to it, these plates medio-longitudinally sulcate. Ovipositor only moderately deep, curved gradually and weakly dorsad; sides very finely toothed, this becoming weaker proximad and disappearing at base, dorsal and ventral margins serrato-dentate, this heaviest distad, those of the ventral margin weaker, more spaced and directed proximad. Subgenital plate small, rounded triangular.

	Length of body	Length of pronotum	Greatest dorsal width of pronotum	Length of tegmen	Length of wing beyond tegmen	Length of caudal femur	Length of ovipositor
♂							
Ash Meadow, Nevada.	11.5 [37]	3.2	2.	18.8	9.4	22.8	——
Prescott, Ariz. *Type.*	14.7	3.2	2.1	21.	11.8	24.8	——
Prescott, Ariz. *Paratype.*	13. [37]	3.3	2.	19.01	10.8	10.8	——
♀							
Crestline, Nevada.	18.	3.9	2.4	3.5	——	22.5	5.2
Beatty, Nevada.	17.3	4.4	2.6	3.2	——	21.	5.3
Prescott, Ariz. *Allotype.*	15.8	4.4	2.7	2.9	——	22.3	5.4
Prescott, Ariz. *Paratype.*	17.2	4.3	2.8	3.7	——	24.8	5.3

General coloration light green (bodies frequently faded to buffy or brownish), femora often suffused with purplish. Markings very delicate. Head with two vertical lines of whitish running down from antennal sockets to border clypeus; dorsal surface of fastigium purplish; a very narrow postocular bar of whitish margined internally with purplish, this continued briefly on pronotum. Caudal margin of pronotum narrowly whitish margined internally with purplish, this marginal marking becoming wider on lateral lobes; pronotal surface usually microscopically dotted with purplish, these dots sometimes very numerous. Abdomen dorsad similarly dotted, a very fine medio-longitudinal whitish line flanked with purplish and on each side a broader band of whitish flanked dorsad with purplish, these lateral bands showing strong convexity ventrad. Tegmina and wings light green, immaculate except that the males have the stridulating field suffused laterad with brown and margined externally with purplish. Apices of male cerci dark brown.

The female from Beatty, Nevada, shows a response to that arid environment in being whitish buff with sides and femora beautifully tinted with very pale green. In this specimen all trace of the purplish margins of the whitish markings is lost while the purplish dots are unusually numerous but minute in the extreme.

[37] Body shrivelled.

Preservation of the color in such fragile insects is extremely difficult.

Specimens Examined: 208; 142 males, 21 females and 45 immature individuals.

NEVADA: Crestline, 600 feet, IX, 4, 1909, (Rehn and Hebard; in bunch of dry yellow grass among junipers where there was hardly any other vegetation), 1♀. Ash Meadows, Amargosa Desert, 2300 feet, VIII, 14 to 19, 1921, (Knaus, Nininger and Hoover), 1♂. Beatty, 3309 feet, VIII, 12, 1919, (J. A. G. Rehn; beaten from top of a spiny greenish-gray desert bush near dry bed of Amargosa River), 1♀.

ARIZONA: Prescott, 5400 feet, VII, 8 to VIII, 24, 1917, (Poling; Kusche), 100 ♂, 19 ♀, *type, allotype, paratypes;* VII, 1 to VIII, 25, 1917, 18 juv. ♂, 24 juv. ♀. Granite Peak, Prescott, VIII, 6 and 17, 1917, (J. A. Kusche), 15 ♂, 1 juv. ♂, 1 juv. ♀. Mount Trydal, Prescott, 7300 feet, VIII, 27 and 28, 1917, (J. A. Kusche), 1♂. Senator, VIII, 12, 1917, (J. A. Kusche), 19♂, 1 juv. ♂. Kingman, VII, 17 to VIII, 25, 1920, (O. C. Poling), 6♂.

Arethaea gracilipes papago new subspecies

(Pl. V, fig. 7; pl. VI, figs. 3 to 6.)

Very large series of the genus now before us show that Rehn and Hebard's concept of *gracilipes gracilipes* (Thomas) in 1914 was incorrect. It is now evident that *constricta* Brunner is a distinct species but that *gracilipes* is divisible into three races, the typical condition occurring in southern Colorado, western Oklahoma, the Pan-Handle of Texas and New Mexico; an undescribed race is present in the Big Bend of the Rio Grande in Texas and the present race to the west of these.

All of the races of *gracilipes* are separated from the two races into which *constricta* divides by not having the pronotum with caudal margin of disk sharply angulate produced at slightly less than a rightangle and never having the sutural margin of the tegmina darkened with the principal veins there paler than the intervening areas. Typical *constricta* is known from Texas, the undescribed race occurring in the central southern portion of the latter State.

The present race is very close to typical *gracilipes* (see plate V, figure 7), separated only by the decidedly weaker development of the specialization of the first abdominal tergite in the male, while none of the many females before us show reduction in the organs of flight (which is often indicated, though individually to a highly variable degree, in *gracilipes gracilipes*).

Type.—♂; Growler Valley, south of Growler Pass, Pima County, Arizona. Elevation 1200 feet. September 19, 1922. (Rehn and Hebard). [Hebard Collection, Type no. 1278].

Pronotum with margins simple; caudal margin of disk bluntly (rarely sharply) obtuse-angulate (individually varying to rectangulate) produced. First abdominal tergite (following median segment) with height of its meso-caudal specialization not as great (individually varying to equal) its basal width, its apex rounded (this process in typical *gracilipes* higher than its basal width with apex bulbous). Abdominal tergites with caudal margins showing laterad very faint but appreciable traces of crenulation. Supra-anal plate simple, not recessed into the preceding tergite, as broad as long, its dorsal surface moderately concave, its margins convex (varying individually from semicircular to having the lateral margins straight proximad, thence broadly rounding). Cerci strongly bent inward distad, the apical portion weakly horizontally flattened, its margins converging to form a moderately stout acute tooth. Organs of flight slender and caudate. Tegmina with stridulating field moderately produced at apex of stridulating vein. Femora not compressed distad nor angulate produced disto-dorsad.

Allotype.—♀; same data as type. [Hebard Collection].

Very similar to male in ambisexual features, the organs of flight fully as caudate (subject to some slight individual variation in both sexes). Form very similar, though the abdomen is considerably larger. Ovipositor deep, curved moderately dorsad, proportionately shorter than in *coyotero* here described.[38]

The coloration is much as here described for *coyotero,* all of the markings often even weaker and the whitish markings when extensive usually less heavily bordered with purplish.

The measurements of twenty individuals were given by Rehn and Hebard in 1914. The type and allotype measure as follows: length of body ♂ 13.7, ♀ 14.2; length of pronotum ♂ 3.7, ♀ 3.8; greatest dorsal width of pronotal disk ♂ 2, ♀ 2; length of tegmen ♂ 21.1, ♀ 22; length of wing beyond tegmen ♂ 7.9, ♀ 8.1; length of caudal femur ♂ 24.4, ♀ 26.6; length of ovipositor 4.8 mm.

This race was recorded as *A. constricta* Brunner in 1907 by Rehn from Tucson and by Snow from there and the Baboquivari Mountains. Twenty-six specimens were later recorded as *A. gracilipes constricta* by Rehn and Hebard from Tucson, Tumamoc Hill, Roeble's Pass, Sahuaro Plain, Snyder's Hill, Roeble's Rancho, Palo Alto Rancho, Espinosa Rancho and Sycamore

[38] A female of this race from Tucson, Arizona, was fully described by Rehn and Hebard, Trans. Amer. Ent. Soc., XL, p. 123, (1914).

Canyon in the Baboquivari Mountains, Arizona.[39]

From material before us the distribution of *gracilipes gracilipes* is found to extend westward as far as Fort Wingate, the White Sands and Bent, New Mexico.

The range of *gracilipes papago* reaches east to Oracle the Santa Rita and the Patagonia Mountains, Arizona and it is known from many localities westward and not far from the Mexican border as far as the Growler Valley, but still further west and north we have it from Blythe, on the Colorado River in California and from Wickenburg and Kingman, Arizona. It is probable that the species will be found extensively distributed in northeastern Arizona and that *gracilipes gracilipes* is the race there represented, but in central eastern Arizona we do not know which race will be found and in extreme southeastern Arizona, though much collecting has been done, it has not been seen, though we have numerous records from there of *A. sellata* Rehn and *A. carita* Scudder.

The following additional specimens have been studied: 66; 36 males, 18 females and 12 immature individuals.

Arizona: Oracle, IX, 8, 1931, (E. R. Tinkham), 4♂, 2♀. Santa Catalina Mountains, VIII, 25, 1924, (A. A. Nichol), 1♂, [Univ. of Ariz.]. Lower Madera Canyon, Santa Rita Mountains, 4500 feet, IX, 26, 1924, (J. A. G. Rehn; in bunch of dry grass at foot of hill), 1♀. Madera Canyon, Santa Rita Mountains, IX, 10, 1931, (E. R. Tinkham), 1♂. Sycamore Canyon, Patagonia Mountains, 4300 to 5600 feet, IX, 22, 1922, (R. & H.; occasional in much dry grass on gravelly ridges), 3♂, 6♀. South slopes of Atascosa Peak, Pajaritos Mountains, VIII, 31, 1927, (J. C. Bradley), 1♀, [Cornell Univ.]; 5100 to 5500 feet, IX, 21 and 22, 1924, (R. & H.), 1♂, 1♀. Bear Valley, Pajaritos Mountains, 5300 feet, IX, 21, 1922, (R. & H.), 1♂. Austerlitz, Tumacacori Mountains, 4325 feet, IX, 21, 1924, (R. & H.), 1♀. Tucson, VI, 14 to VIII, 24, 1922 and 1924, (A. A. Nichol; one at light), 3♂, [Univ. of Ariz.]. Tucson Mountains, IX, 4, 1931, (E. R. Tinkham), 1 large juv. ♂. Quinlan Mountains, IX, 3, 1931, (E. R. Tinkham), 2♂, 1 large juv. ♀. Roadside Mine, Coyote Mountains, 2800 feet, IX, 14, 1924, (J. A. G. Rehn; beaten from rabbit-weed), 1 large juv. ♀. Coyote Mountains, 3500 feet, VIII, 4 to 7, 1916, (Rehn and Lutz), 2 very small juv. ♂, [A.M.N.H. and A.N.S.P.]. Near Kit's Peak, Baboquivari Mountains, 3600 feet, VIII, 7 to 9, 1916, (Rehn and Lutz), 1 very small juv. ♂, 1 very small

[39] Trans. Amer. Ent. Soc., XL, p. 124, (1914). The female at that time so recorded from Pine, Arizona, can not at present be determined as to race.

juv. ♀, [A.M.N.H. and A.N.S.P.]. Cobabi Mountains, IX, 2, 1931, (E. R. Tinkham), 1 large juv. ♂. Four miles east of Pozo Blanco, Quijotoa Mountains, 2750 feet, IX, 17, 1924, (R. & H), 1♂. Covered Wells, IX, 2, 1931, (E. R. Tinkham), 1 large juv. ♀. Quijotoa Mountains, IX, 1, 1931, (E. R. Tinkham), 1♂, 2♀. Thirty miles south of Quijotoa, Baboquivari Valley, VIII, 28 and 29, 1927, 4♂, [Cornell Univ.]. Valley of the Ajo six miles north of Ajo, 1600 feet, IX, 18, 1922, (R. & H.), 2♂, 2♀, *paratypes,* 1 large juv. ♂, 1 large juv. ♀. Ajo, in Little Ajo Mountains, VIII, 31, 1931, (E. R. Tinkham), 1♂, 1♀, *paratypes;* 1800 feet, IX, 18, 1922, (M. Hebard; in small low clumps of a gray-green leaved desert brush), 2♂, *paratypes.* Growler Valley south of Growler Pass, 1200 feet, IX, 19, 1922, (R. & H.; occasional in short drying grasses of wash), 5♂, 1♀, *type, allotype, paratypes,* 1 large juv. ♀. Kingman, VIII, 2, 1920, (O. C. Poling), 2♂. Wickenburg, VII, 27, 1933, (R. H. Beamer), 1♂, [Univ. of Kansas].

CALIFORNIA. Blythe, VIII, 20, 1927, (J. C. Bradley), 1♂.

Two males of this race from Nogales, Sonora, Mexico, were recorded as *A. g. gracilipes* by Hebard in 1932.

Arethaea polingi new species (Pl. V, figs. 8 and 9; pl. VI, figs. 8 and 9.)

This interesting species occupies a position between *A. carita* Scudder and *A. brevicauda* (Scudder). The lack of nodes on the margins of the abdominal tergites, even distal curvature of the male cerci and very great reduction of the organs of flight in females show agreement with the latter species, but the stridulating field of the male tegmina is decidedly less produced at the apex of the stridulating vein as in *carita* and the specialization of the first abdominal tergite is less decided but of the same type as in that species.

The ovipositor is even shorter than in *brevicauda* and is definitely bent dorsad.

Type.— ♂; Prescott, Arizona. July 5, 1917. (O. C. Poling). [Hebard Collection, Type no. 1279].

Size moderately large, form very elongate. Head and margins of pronotum as here described for *A. coyotero.* Pronotum moderately inflated, sub-bullate across the lateral lobes, strongly sellate; caudal margin of disk roundly angulate produced at slightly less than a rightangle; lateral lobes elongate, longer even than in *A. gracilipes papago* here described, humeral sinus rounded rectangulate emarginate, convex callosity very large and decidedly inflated. Tegmina elongate and narrow, very slightly narrower meso-proximad than meso-distad, not darkened at sutural margins; stridulating field large for the genus, decidedly produced at apex of stridulating vein. Wings strongly surpassing tegmina, extending decidedly beyond

apices of caudal femora. Abdominal tergites with caudal margins neither nodose or crenulate but showing a meso-lateral angulate production. Abdomen with first tergite (succeeding median segment) specialized meso-distad, this process moderately high, apex convex, cephalic surface and adjacent surface of tergite thickly hirsute, margins of tergite laterad of this specialization turned dorsad and convex in outline to its base; ultimate tergite and supra-anal plate as here described for *coyotero*. Cercus stout, gradually tapering and straight to apical portion which curves gently inward, is tapered more strongly in proximal portion and terminates in an acute chitinous apex. Subgenital plate broad, moderately elongate, the distal margin straight, transverse, between the elongate slender styliform processes. Limbs exceedingly elongate and slender. Femora with apices formed and genicular lobes armed as here described for *coyotero*.

Allotype.—♀; same data as type but taken July 11, 1917. [Hebard Collection].

Decidedly more robust than male with decidedly shorter and slightly heavier limbs. Pronotum weakly sellate and convex callosity narrower and very weakly inflated. Tegmina represented by very short convex overlapping pads, their venation distinct, their outline not as rounded in dorsal aspect as in *coyotero*, each tapering to the broader rounded apex. Ultimate tergite and supra-anal plate as here described for this sex of that species. Ovipositor rather deep and very short, bent dorsad though the curvature of the ventral margin is even, armament as in *coyotero*. Subgenital plate much as in that species. Pronotum differing from that of male in being narrower dorso-caudad with latero-caudal shoulders much less distinct and humeral sinus barely indicated by a broad and very shallow concavity of the margin.

	Length of body	Length of pronotum	Greatest dorsal width of pronotum	Length of tegmen	Length of wing beyond tegmen	Length of caudal femur	Length of ovipositor
♂							
Prescott, Ariz. *Paratype*.	14.3 [40]	4.2	2.7	21.9	13.2	26.	——
Prescott, Ariz. *Type*.	17.	4.2	2.8	24.6	12.1	28.	——
Kingman, Ariz.	15.5	4.1	2.7	20.7	10.8	25.7	——
♀							
Prescott, Ariz. *Paratype*.	13.1 [40]	4.3	2.3	3.	——	23.3	4.3
Prescott, Ariz. *Allotype*.	19.3	4.7	2.3	3.	——	24.	4.4
Prescott, Ariz. *Paratype*.	20.	4.9	2.4	3.7	——	25.2	4.9

[40] Abdomen retracted.

General coloration very light green in male, darker in the female, markings as here described for *coyotero* except as follows. Pronotum lacking microscopic purplish flecks except in intensively colored females. Stridulating area of male tegmina pale brownish buff, this slightly darker proximo-laterad and on stridulating vein.

Specimens Examined: 11; 7 males and 4 females.

ARIZONA: Prescott, VII, 5 to 24, 1917, (O. C. Poling), 3♂, 4♀, *type, allotype, paratypes.* Truxton, VI, 16, 1920, (O. C. Poling), 2♂. Kingman, VI, 20 and VII, 17, 1920, (O. C. Poling), 2♂.

DECTICINAE

Ateloplus coconino new species. (Pl. VII, figs. 1 and 2)

1905. *Ateloplus notatus* Rehn (not of Scudder, 1900), Trans. Kansas Acad. Sci., XIX, p. 227. [♂; Bill Williams Fork, Arizona.]
1907. *Ateloplus notatus* Snow (in part not of Scudder, 1900), Trans. Kansas Acad. Sci., XX, p. 39. (Same specimen as above only.)
1907. *Ateloplus notatus* Caudell (in part not of Scudder, 1900), Proc. U.S. Nat. Mus., XXXII, p. 369, fig. 55. (Same specimen as above only.)

The general appearance of this insect closely resembles that of normal weakly mottled males of *A. schwarzi* Caudell from southern Arizona. The male cerci are, however, very distinct, showing closest agreement with those of the larger, more robust and distinctively marked *A. splendidus* Hebard from southeastern California. The male cerci in these two species are of the more conventional type, not developed in any of the other species of the genus.

Type.—♂; Bill Williams Fork, Arizona. August, 1903. (F. H. Snow). [Hebard Collection, Type no. 1284].

Size large for the genus, form robust. Head much as in *schwarzi,* rather full and rounded but proportionately distinctly narrower than in *splendidus;* fastigium with dorsal surface showing a short strong medio-longitudinal sulcus distad (this in *schwarzi* normally obsolete, rarely very weakly indicated), width of fastigium slightly greater than that of first antennal joint as in that species. Pronotum with disk rounding evenly into the shallow lateral lobes with cephalic and caudal margins truncate, the first transverse sulcus fine but decided, the other sulci distinct only on the lateral lobes, generally of the same type as in *schwarzi* but proportionately more elongate, with caudal portion of ventral margin of lateral lobes straight instead of very shallowly concave and the large adjacent convex callosity larger and distinct. Tegmina with less than half of portion beyond stridulating vein projecting (in *schwarzi* with all or nearly all of the portion beyond the stridulating vein exposed). Prosternum unarmed.

Ultimate tergite with two small sharp triangular projections, each broader than long, on each side of a meso-distal impression; these considerably shorter than in *schwarzi,* much as in *splendidus* but like *schwarzi* with latero-distal margins lacking the deflexed area with margins broadly convex developed in that species. Titillators represented by two divergent slender flattened chitinous fingers which widen very slightly and gradually distad and have their external margin sharply toothed; much as in *splendidus,* in which species, however, the external margin is sometimes slightly convex distad; in *schwarzi* a distal convexity is very pronounced, the external margin toothed there only, but the shaft with numerous teeth on the dorso-external surface of its proximal portion. Cercus moderately large; a straight cylindrical shaft, with apical portion, beyond the rather large slightly recurved disto-internal tooth, bent very weakly outward and tapering to the bluntly rounded apex; of the same general type as in *splendidus* which species, has the cercus, however, proportionately much smaller, the external margin of the shaft showing faint convexity and the apical portion shorter and heavier. Subgenital plate much as in *splendidus;* heavy rounded lateral carinae run to the sockets of the simple cylindrical styles which are over twice as long as broad, each distinctly longer than the width of the intervening margin which is angulate-emarginate at slightly more than a rightangle; in *schwarzi* the cerci are smaller and the intervening area broader and very shallowly concave (or rarely rounded obtuse-angulate emarginate). Cephalic tibiae proportionately more elongate than in *schwarzi,* with dorso-external margin armed with a very minute proximal, a median (on one limb but not on the other) and a distal spine. Femora as in *schwarzi* but not as in *splendidus* with cephalic-internal, median-external and median-internal genicular lobes alone armed with a minute spine. Ventral femoral margins armed with small spines as follows: cephalic-internal 5 and 6, external 0; median-internal 1 and 4, external 5 and 7; caudal-internal 7 and 9, external 7 and 7. Caudal femora very robust.

Allotype.—♀; Kingman, Arizona. August 16, 1920. (O. C. Poling). [Hebard Collection].

Generally similar to male in ambisexual features, smaller.[41] Tegmina represented by small vestigial lateral pads concealed by the pronotum. Pronotum similar to that of male but with caudal margin of disk very shallowly concave and caudal margin of lateral lobes opposite the subobsolete convex callosity[42] shallowly concave, in this feature agreeing

[41] This probably indicates decided size variation in the species, as in series from the same locality females of other species of *Ateloplus* are in most cases larger than the males.

[42] Which however is prominent in the paratypic female from west of Blythe, California.

closely with females of *schwarzi.* Ultimate tergite medio-longitudinally deeply sulcate and with caudal margin not produced (or very briefly triangularly produced in paratype) above each side of the very small rounded triangular supra-anal plate. Ovipositor comparatively short for the genus, decidedly shorter than the robust caudal femur, broadly curved dorsad, base stout, apex very sharply acute, margins unarmed, dorsal and ventral valves each with a medio-longitudinal carina only at apex. Sternite preceding the subgenital plate with a large prominent but bluntly rounded meso-proximal projection (less prominent and even more broadly rounded in paratype), preceding tergite unspecialized. Subgenital plate with lateral margins very broadly convex convergent to the small concave meso-distal emargination which is as deep as broad, along the sides of that emargination and gradually diverging to the base of the plate are two very coarse rounded carinae and there is a finer medio-longitudinal carina decidedly developed only toward the base of the plate (in the paratype the lateral carinae are more divergent and disappear two-thirds the distance to the base of the plate while the medio-longitudinal carina is percurrent and equally decided throughout its length).[43]

In considering the specialization of the sternites in females of *Ateloplus* we find that *A. splendidus* agrees with *coconino* in this feature except that the sternite preceding the subgenital plate shows meso-proximad an even weaker though more extensive projection which could therefore be easily overlooked. In *A. luteus* Caudell and *A. hesperus* Hebard that sternite bears a more prominent projection than in *coconino* while there is also a large rounded projection mesad on the preceding sternite. In females (including the type) of *schwarzi* similar specialization to that of *luteus* is developed, but in some others, which are apparently wholly inseparable and taken with males which are normal for that species, the preceding tergite is unspecialized as in *coconino.* Such difference, which apparently has no geographic significance, we can not explain at the present time.

Male dull clay color inconspicuously marked with darker, this shown particularly on disk of pronotum as a medio-longitudinal and two narrow postocular lines which latter converge caudad and all became practically obsolete at the principal sulcus, to reappear very feebly as a medio-longitudinal and marginal lines on the metazona. Antennae tawny, very thickly, irregularly and vaguely annulate with deep russet. Abdomen with

[43] In spite of the evident considerable individual variation we believe, from our series of females of the other species of *Ateloplus,* that the female subgenital plate shows important diagnostic characters to distinguish most if not all of these.

very minute flecks of dark brown. Caudal femora externally with a narrow medio-longitudinal line of dark brown which disappears before reaching either end of the enlarged portion, apices extensively suffused with blackish brown before which the limb is buffy for an even greater distance.

The female allotype is marked very much like the male. The large immature male is paler, immaculate, clay color. The other female, a paratype, and the large immature female are maculate, grayish with a broad striking percurrent medio-longitudinal dorsal stripe of blackish brown much resembling the vittate color phase frequently developed in *luteus*.[44]

All of these specimens have the caudal femora marked as described for the male type except the very recessively colored immature male in which all trace of such marking is lost.

The measurements of the adults before us are as follows, those of the allotype being given last: length of body ♂ 23., ♀ (abdomen extruded in both) 23. and 22.3; length of pronotum ♂ 6.9, ♀ 6.6 and 6.2; greatest (meso-caudal) width of pronotum ♂ 6.6, ♀ 6. and 5.8; exposed length of tegmen ♂ 1.7; length of cephalic femur ♂ 6.4, ♀ 5.7 and 5.2; length of caudal femur ♂ 17.8, ♀ 16.7 and 16.; greatest width of caudal femur ♂ 4., ♀ 4. and 4.; length of ovipositor 12.7 and 10.1 mm.

In the immature male the cerci have the apical production of the shaft much weaker with tooth consequently more distal, much as in adults of *A. notatus* Scudder. This may be the normal shape of the male cercus in the instar preceding maturity.

Specimens Examined: 5; 1 male, 2 females and 2 immature individuals.

Arizona: Ash Fork, VI, 16, 1921, (C. D. Duncan), 1 large juv. ♂. Kingman, VIII, 16, 1920, (O. C. Poling), 1♀, *allotype*. Yucca, Mohave County, VI, 14, 1921, (C. D. Duncan), 1 large juv. ♀. Bill Williams Fork, 1903, (F. H. Snow), 1♂, *type*.

California: Twenty-five miles west of Blythe, VIII, 18 and 19, 1927, (on Yucca), 1♀, *paratype*.

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[44] Caudell described *Ateloplus luteus* from "Mohave, Arizona", the original pair taken by H. F. Wickham. These specimens agree extremely closely with a pair now before us from Mojave, California. We believe Wickham's specimens came also from that locality as most of his work was done in Nevada and California not far east of the mountains and there is no Mohave, Arizona, although there is a Mohave County. In that county we find *coconino*, a species which differs signally from *luteus* in both sexes, but the two are sufficiently closely related to occupy a very similar if not identical niche in their respective faunas and we very much doubt that one will be found to have to any extent coincident distribution with the other.

RHAPHIDOPHORINAE

Pristoceuthophilus arizonae new species. (Pl. VII, figs. 3 to 5.)

This species is particularly distinguished by having the male abdominal tergites smooth, the nearest approach to this condition in the other species of the genus is found in the Mexican *P. rhoadsi* Rehn, known only from an immature male in the Academy Collection, which specimen shows merest traces of tuberculation on the abdominal tergites, this however indicating that such tuberculation is more distinct in adults.

The male cerci are unspecialized as in *rhoadsi, P. pacificus* (Thomas) and *P. marmoratus* (Rehn). The caudal femora are very heavy, particularly in the male which sex shows a very large heavy external and internal tooth on the ventral margins as in *pacificus* (and sometimes in *marmoratus*). The male caudal tibiae are as arcuate as in *pacificus* or *marmoratus,* with ventro-proximal swelling decidedly greater than is ever the case in those species. The tessellation of the body is quite as conspicuous as in *marmoratus.* The labrum is not swollen, this being a conspicuous feature in both sexes of *marmoratus.* The male pseudosternite and penis are distinctive.

Type.— ♂ ; North slopes of Santa Catalina Mountains, south of Oracle, Arizona. Elevation 9300 feet. September 5 to 7, 1931. (E. R. Tinkham). [Hebard Collection, Type no. 1200].

Size small, limbs rather short, caudal femora very robust for the genus. Vertex a blunt deflexed spine, as characteristic of the genus. Antennae comparatively not elongate, not much longer than the body. Clypeus moderately convex, (not greatly swollen as is the case in *marmoratus*). Palpi very elongate, the ultimate joint curved and one and two-fifths times as long as the preceding joint. Apterous. Dorsal surface smooth and shining, without trace of tuberculation. Cerci simple, tapering, segments distinct only distad. Tenth tergite rather strongly concave mesad. Narrow chitinous margin of pseudosternite produced mesad as a narrow lamella with apex formed by two triangular projections. Below this is the large soft penis, thickly covered with very minute spinulae. Subgenital plate convex, rounded angulate emarginate between the short straight socketed styles. Cephalic and median femora with ventro-cephalic margin armed distad with (0 to 2 in series) small spines. Caudal femora short and extremely inflated, dorsal and a latero-distal area thickly armed with very small short teeth, similar teeth thickly scattered along the ventro-external

margin; ventral margins not lamellate, armed distad each with a single very large tooth, the internal of these the largest and not as near the apex of the limb. Caudal tibiae violently curved dorsad in meso-proximal portion, before which the ventro-proximal surface is produced in a large rounded-triangular lamellation; dorsal margins armed with 4 rather short spines between which are (5 to 7) regular minute teeth. Spurs not very elongate, the longest (meso-internal) about two-thirds as long as the metatarsus. Pulvilli occupying all of ventral surfaces of the tarsal joints. Arolium absent.

Allotype.— ♀ ; same data as type. [Hebard Collection].

Slightly smaller than male (as is the average throughout the series). Tenth tergite little impressed. Ovipositor slender, short, weakly recurved, disto-ventral serrations of working valves very shallow and very broad. Subgenital plate very small, rounded triangular. Caudal femora smooth except for a few minute teeth distad on ventro-internal margin. Caudal tibiae straight and unspecialized proximo-ventrad.

Coloration chestnut brown flecked with buffy, this rather generally distributed, but pronotum, mesonotum and metanotum sometimes appearing somewhat banded, due to the greater number and crowding of the darker areas caudad. Limbs buffy, the caudal femora and tibiae mottled with brown, the darkest markings usually along the ventro-median line of the external surface of the caudal femora (not along their ventro-external margins as is the case in *rhoadsi,* where there are very dark and conspicuous markings).

Decided size variation, apparently usual in the species of this genus, is shown by the series of paratypes, the measurements of which are as follows. Length of body ♂ 9.2 to 12.6, ♀ 10. to 12.8; length of pronotum ♂ 2.7 to 2.9, ♀ 2.8 to 3.3; length of cephalic femur ♂ 3.7 to 4.2, ♀ 3.6 to 4.1; length of caudal femur ♂ 7.7. to 10., ♀ 7.7 to 8.5; width of caudal femur ♂ 2.8 to 3.8, ♀ 2.8 to 3.1; length of ovipositor 5.3 to 6. mm. The size of the series before us averages only a little below the maximum given above. It is to be remembered in studying the species of *Pristoceuthophilus* that the armament of body and caudal femora and curvature and specialization of the caudal tibiae in males appears only in the late instars of immaturity and is far more pronounced in the adult normally than in the instar preceding maturity, but that adult males in many, if not all of the species, may occasionally be far less highly specialized along these lines than is normal for their species, and such specimens usually show some or decided depauperation.

Specimens Examined: 39; 14 males, 15 females and 10 immature individuals.

ARIZONA: Chiricahua Mountains, 8900 feet, IX, 12 to 14, 1931, (E. R. Tinkham), 3♂, 3♀, [Hebard Cln.]. Santa Rita Mountains, IX, 5, 1933, (E. D. Ball), 2♂, [Univ. of Arizona and Hebard Cln.]. Madera Canyon, Santa Rita Mountains, 4900 to 5000 feet, IX, 24, 1924, (M. Hebard; one under can among dead oak leaves, one between granite boulders, two on or near dead oak stumps, all in low oak forest of canyon bottom), 1♂, 3♀, IX, 10, 1931, (E. R. Tinkham), 1 very small juv. ♂, [Hebard Cln.]. North slope of Santa Catalina Mountains, south of Oracle, 9300 feet, IX, 6 and 7, 1931, (E. R. Tinkham), 8♂, 8♀, *type, allotype, paratypes,* 5 juv. ♂, 3 juv. ♀, 1 very small juv., [Hebard Cln.].

GRYLLIDAE

GRYLLINAE

In considering a new species from Arizona before us we at once recognized its affinity to *Gryllodes toltecus* Saussure, but realized also the wide difference between these species and the genotype *G. sigillatus* (Walker). Turning to the literature we find that though *sigillatus* has been distributed throughout the tropics of the World (apparently by commerce) and in 1906 was selected by Kirby as genotype of *Gryllodes* Saussure 1874, little or no attention has been paid it by the describers of the very many species which have been referred to this genus. Its synonyms are *Gryllus pustulipes* Walker 1869, *Gryllodes poeyi* Saussure 1874, *Homaloblemmus indicus* Boliver 1900, *Miogryllus transversalis* Scudder 1901 and *Gryllodes subapterus* Chopard 1912.

Though *Gryllodes* long remained the repository for many widely distinct species, Chopard has in recent years vastly improved the situation by proposing *Itaropsis* in 1925, *Eugryllus* in 1927 (thereby removing all of the European and a number of other Old World species) and *Gryliopsis* in 1928.

In our studies of *Miogryllus* Saussure 1877 which were published in 1915 we noted that many of the American species which had been referred to *Gryllodes* were referable to that genus and established a number of synonyms. It is now clear that the new genus *Gryllita,* here proposed, is actually very much nearer *Miogryllus* than *Gryllodes.*

Material of all the genera concerned is before including the genotypic species of all but *Gryllopsis.* These genera may be distinguished as follows:

1. General appearance unlike *Gryllomorpha*. Form compact. Caudal femora proportionately shorter. Caudal tibiae with disto-external spine shorter than the dorso-external spur.....2

   General appearance very similar to *Gryllomorpha*. Form less compact, depressed. Caudal femora proportionately longer. Caudal tibiae with disto-external spine longer than the dorso-external spur. (Head not large, obliquely flattened. Pronotum (and mesonotum of female) transversely vittate. Pronotum widening little caudad. Mediastine vein of male tegmina branched distad.)

   Gryllodes Saussure

   Genotype, *G. sigillatus* (Walker)

2. Male tegmina with two oblique veins. New World genera. (Pronotum widening little caudad. Head quite evenly rounded, normally[45] not large.).....3

   Male tegmina with over two oblique veins. Old World genera.....4

3. Coloration quite uniform, without markings, appearance glabrous, occiput never with vertical vittae, lateral lobes of pronotum never bicolored. Appearance definitely Grylloid but, to different degrees in different species, suggesting such Phalangopsine genera as *Gryllosoma* Hebard and *Tairona* Hebard.

   Gryllita new genus

   Genotype, *G. arizonae* new species

   Coloration not uniform, frequently tessellate, appearance not glabrous, occiput (except in decidedly intensively colored individuals) with vertical vittae, lateral lobes of pronotum usually particolored (except in *convolutus*). Appearance definitely Grylloid, the smaller species (of which *convolutus* is the smallest) suggesting the Nemobiine genus *Nemobius* Serville.....*Miogryllus* Saussure[46]

   Genotype, *M. convolutus* (Johansson)

4. Coloration paler, with dark markings. Appearance Grylloid. Head full and rounded. Pronotum widening little caudad. Caudal femora short and very robust.....5

   Coloration dark, without markings, appearance glabrous. Appearance Eneopteroid. Head comparatively small. Pronotum of male[47] widening strongly caudad. Caudal femora not as robust. (Male tegmina very fully developed, not at all reduced distad).

   Itaropsis Chopard

   Genotype, *I. parviceps* (Walker)

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[45] Except in rare individuals of *Miogryllus verticalis* (Serville) and *Miogryllus lineatus* (Scudder) in which very strong megacephalism occurs.

[46] This genus was studied by the author in 1915, Jour. New York Ent. Soc., XXIII, pp. 101 to 121.

[47] The female sex, just received through the kindness of L. Chopard, has the pronotum little widened caudad and, as in *Anurogryllus*, the ovipositor is barely visible.

5. Form robust. Head pale with longitudinal darker stripes.
Eugryllus Chopard
Genotype, *E. pipiens* (Dufour)

Form very robust. Head with dark transverse bands.
Gryllopsis Chopard
Genotype, *G. niloticus* (Saussure)

The logical sequence of these and related genera is as follows: *Acheta, Gryllus, Miogryllus, Gryllita, Eugryllus, Gryllopsis, Itaropsis, Anurogryllus.*

The Genus *Gryllita* includes *arizonae* here described, the Mexican *tolteca* (Saussure) and *forcipata* (Saussure). To it may also belong *Gryllodes rufipes* Redtenbacher, described from St. Vincent, a large species in which the female has lobiform tegminal pads. In addition three undescribed Costa Rican species are before us representing this or a very closely allied genus.

On the other hand the unicolored *Miogryllus tucumanensis* Giglio-Tos from South America can apparently not remain in that genus, but its proper generic association can not be determined from the original description.

Gryllita arizonae new species (Pl. VII, figs. 6 to 8.)

Nearest *G. tolteca* (Saussure), this species may be easily separated by its smaller size, paler head and pronotum, male tegmina much less abbreviate and not at all truncate so that only the tip of the subgenital plate is exposed and female apterous with ovipositor proportionately much longer and with differently specialized apex.

In *G. forcipata* (Saussure) the male has even more reduced tegmina than in *tolteca* and in both the titillatores are very differently specialized.

Type.— ♂ ; Hendricks Canyon, Baboquivari Mountains, Arizona. Elevation 3200 feet. September 14, 1924. (M. Hebard). [Hebard Collection, Type no. 1280].

Size rather small for the genus, form moderately robust, limbs short, caudal femora robust though slightly less so than in *tolteca*. Head similar, small, quite evenly rounded, facial projection not decided, eyes rather small. Lateral ocelli large, the median ocellus very small, these forming a triangle the base of which is nearly three times its height. Palpi elongate,

considerably more elongate than in *tolteca*. Pronotum with a very delicate medio-longitudinal sulcus, cephalic margin broadly concave, caudal margin transverse but showing very feeble convexity, lateral lobes deeper cephalad than caudad. Tegmina very ample, the apex of the subgenital plate alone projecting beyond them; dorsal fields flat, broader than body, lateral margins very weakly convex and rounding into the caudal margin which is more strongly convex; two oblique veins present, mirror large and lacking a transverse vein; lateral fields deep, the mediastine vein with a single delicate distal branch, five (and sometimes six) free veins present. Wings absent. Titillatores short, not visible unless dissected out,[48] their sides converging to the truncate apex which is deeply hollowed out and is bordered by very small blunt points which curve slightly inward and thus roughly suggest the empty setting of a ring. Subgenital plate truncate conical, longer than its greatest width. Cephalic tibiae with very large oval auditory foramen on caudal face only. Caudal femora armed dorsad with six external and five (or six) internal spines and three pairs of distal spurs of which the dorso-internal is very long and the medio-internal slightly longer. Caudal metatarsus with dorsal margins each armed with (six to eight) very small teeth.

Allotype.— ♀ ; Schaeffer Canyon, Baboquivari Mountains, Arizona. Elevation 5200 feet. September 18, 1924. (M. Hebard). [Hebard Collection].

Longer and more cylindrical than male. Lateral ocelli not as large. Pronotum no wider caudad than cephalad. Organs of flight absent. Ovipositor straight, comparatively fairly thick, almost as long as the caudal femur, its apex spear-headed but the upper and lower portions deeply divided much as in *toltecus,* but the dorsal portion is slightly deflexed and the lower portion lacks the distinctive quadrate flange meso-proximad on its dorsal margin shown by *toltecus.*[49]

Head, pronotum and ovipositor rich shining chestnut, limbs often very slightly paler, palpi still paler. Abdomen in the male (concealed) shining blackish brown, the mesothorax and metathorax buffy; in the female (exposed) only slightly less glossy blackish brown. Male tegmina transparent strongly suffused with bister but with dorsal portions of lateral fields (and particularly the veins there) dull bay.

The series before us shows the following extremes in measurements, the allotype being the second female: length of body ♂ 12.4 to 13.7, ♀ 12.8 and 13.4; length of pronotum ♂ 2.7 to 3.3, ♀ 3.5 and 3.3; caudal width of pronotum ♂ 3.8 to 4.7, ♀ 3.9 and 4., length of tegmen ♂ 7.1 to 7.7, width of

[48] In *tolteca* the slender apex of the titillatores projects briefly.

[49] See Saussure, Biol. Cent.-Amer. Orth., I, pl. 2, fig. 28.

tegminal dorsal fields ♂ 4.8 to 5.6; length of caudal femur ♂ 8.3 to 9.2, ♀ 9.5 and 9.3; greatest width of caudal femur ♂ 2.8 to 3., ♀ 3.2 and 3.2; length of ovipositor 9. and 9. mm.

Specimens Examined: 6; 4 males and 2 females.

Arizona: Schaeffer Canyon, Baboquivari Mountains, 5200 feet, IX, 18, 1924, (M. Hebard), 1♀, *allotype.* Hendricks Canyon, Baboquivari Mountains, 3200 feet, IX, 14, 1924, (M. Hebard), 4♂, *type* and *paratypes.* South slopes of Atascosa Peak, Pajaritos Mountains, 5100 feet, IX, 22, 1924, (J. A. G. Rehn; at light at night), 1♀, *paratype.*

This insect was first heard after dark on September 14, 1924, its song a "tschritt" given at short intervals and only moderately loud but high-pitched, resonant and penetrating. About a dozen were heard, all on the floor of the canyon over a distance of one-half mile. All located were near the summits of granite boulders in depressions or crevices. Individuals remained motionless when approached very closely with the hand but attempts to put a finger suddenly down upon them failed several times as they leap with lightning-like agility. Had they not been so fearless, stridulating until closely approached and remaining motionless almost always until an actual attempt at seizure was made, they would have been almost impossible to capture. Their dark color was in sharp contrast to the light-colored boulders when the light was thrown on them. On September 18 a female was found after dark resting on the face of a granite ledge beside a wash and one male was seen there but none were stridulating.

Explanation of Plates

Plate IV

Fig. 1.—*Blattella vaga* new species. Cephalic view of male head. *Type.* Phoenix, Arizona. (X 10.)

Fig. 2.—*Blattella vaga* new species. Dorsal view of male pronotum. *Type.* Phoenix, Arizona. (X 7.)

Fig. 3.—*Blattella vaga* new species. Dorsal view of male supra-anal plate. *Type.* Phoenix, Arizona. (X 15.)

Fig. 4.—*Blattella vaga* new species. Ventral view of male subgenital plate. *Type.* Phoenix, Arizona. (X 15.)

Fig. 5.—*Pseudovates arizonae* new species. Dorsal view of female head. *Type.* Baboquivari Mountains, Arizona. (X 4½.)

Fig. 6.—*Pseudovates arizonae* new species. Dorsal (or caudal) view of median limb of female. *Type*. Baboquivari Mountains, Arizona. (X 3.)

Fig. 7.—*Pseudovates arizonae* new species. Lateral outline of marginal field of female tegmen. *Type*. Baboquivari Mountains, Arizona. (X 1½.)

Fig. 8.—*Eumorsea balli* new genus and species. Dorsal view of male head and pronotum. *Type*. Ramsey Canyon, Huachuca Mountains, Arizona. (X 7.)

Fig. 9.—*Eumorsea balli* new genus and species. Lateral view of male head and pronotum. *Type*. Ramsey Canyon, Huachuca Mountains, Arizona. (X 7.)

Fig. 10.—*Eumorsea balli* new genus and species. Cephalic view of male head. *Type*. Ramsey Canyon, Huachuca Mountains, Arizona. (X 7.)

Fig. 11.—*Eumorsea balli* new genus and species. Cephalic view of female head. *Allotype*. Ramsey Canyon, Huachuca Mountains, Arizona. (X 7.)

Fig. 12.—*Ageneotettix deorum curtipennis* Bruner. Lateral view of male tegmen. Prescott, Arizona. (X 7.) (To show maximum tegminal development at that locality.)

Fig. 13.—*Ageneotettix deorum curtipennis* Bruner. Lateral view of male tegmen. Prescott, Arizona. (X 7.) (To show normal tegminal development at that locality.)

Fig. 14.—*Ageneotettix deorum curtipennis* Bruner. Lateral view of female. Bill Williams Mountain, Arizona. (X 3.) (To show appearance of individual in which great brachypterism is developed.)

Plate V

Fig. 1.—*Perixerus gloriosus* new species. Lateral outline of male cercus. *Paratype*. South slopes of Atascosa Peak, Pajaritos Mountains, Arizona. (Much enlarged.)

Fig. 2.—*Perixerus gloriosus* new species. Penis of *paratype*. South slopes of Atascosa Peak, Pajaritos Mountains, Arizona. (Greatly enlarged.)

Fig. 3.—*Perixerus gloriosus* new species. Dorsal view of female. *Allotype*. South slopes of Atascosa Peak, Pajaritos Mountains, Arizona. (X 3.)

Fig. 4.—*Insara tessellata* new species. Dorsal view of male. *Type*. Wheeler Canyon, Hualapai Mountains, Arizona. (X 2½.)

Fig. 5.—*Insara tessellata* new species. Lateral view of female. *Allotype*. Boulder Spring, Arizona. (X 2½.)

Fig. 6.—*Arethaea coyotero* new species. Dorsal view of male cercus. *Type*. Prescott, Arizona. (X 16.)

Fig. 7.—*Arethaea gracilipes papago* new subspecies. Dorsal view of male cercus. *Type*. Growler Valley, Arizona. (X 16.)

Fig. 8.—*Arethaea polingi* new species. Dorsal view of male cercus. *Type*. Prescott, Arizona. (X 16.)

Fig. 9.—*Arethaea polingi* new species. Lateral view of ovipositor. *Paratype*. Prescott, Arizona. (X 8.)

PLATE VI

Fig. 1.—*Arethaea coyotero* new species. Dorsal view of stridulating field of male tegmina. *Type*. Prescott, Arizona. (X 11½.)

Fig. 2.—*Arethaea coyotero* new species. Lateral view of ovipositor. *Allotype*. Prescott, Arizona. (X 8.)

Fig. 3.—*Arethaea gracilipes papago* new subspecies. Dorsal view of stridulating field of male tegmina. *Type*. Growler Valley, Arizona. (X 11½.)

Fig. 4.—*Arethaea gracilipes papago* new subspecies. Caudal view of specialization of first abdominal tergite of male. *Type*. Growler Valley, Arizona. (Greatly enlarged.)

Fig. 5.—*Arethaea gracilipes papago* new subspecies. Lateral view of dorsal portion of first abdominal tergite of male. *Type*. Growler Valley, Arizona. (Greatly enlarged.)

Fig. 6.—*Arethaea gracilipes papago* new subspecies. Lateral view of ovipositor. *Allotype*. Growler Valley, Arizona. (X 8.)

Fig. 7.—*Arethaea gracilipes gracilipes* (Thomas). Caudal view of specialization of first abdominal tergite of male. *Topotype*. Trinidad, Colorado. (Same scale as Fig. 4.)

Fig. 8.—*Arethaea polingi* new species. Dorsal view of stridulating field of male tegmina. *Type*. Prescott, Arizona. (X 11½.)

Fig. 9.—*Arethaea polingi* new species. Lateral view of dorsal portion of first abdominal tergite of male. *Type*. Prescott, Arizona. (Same scale as Fig. 5.)

Fig. 10.—*Microcentrum californicum* Hebard. Dorsal view of male. Lower Madera Canyon, Santa Rita Mountains, Arizona. (Slightly over X 1½.)

Fig. 11.—*Microcentrum californicum* Hebard. Dorsal view of male cercus. Lower Madera Canyon, Santa Rita Mountains, Arizona. (Much enlarged.)

Fig. 12.—*Microcentrum californicum* Hebard. Lateral view of female. Paradise, Arizona. (X 1½.)

PLATE VII

Fig. 1.—*Ateloplus coconino* new species. Dorsal view of distal portion of male supra-anal plate and of cerci. *Type*. Bill Williams Fork, Arizona. (X 11½.)

Fig. 2.—*Ateloplus coconino* new species. Ventral view of female subgenital plate. *Allotype*. Kingman, Arizona. (X 11½.)

Fig. 3.—*Pristoceuthophilus arizonae* new species. Dorsal view of male. *Type*. North slopes of Santa Catalina Mountains, near Oracle, Arizona. (X 3.)

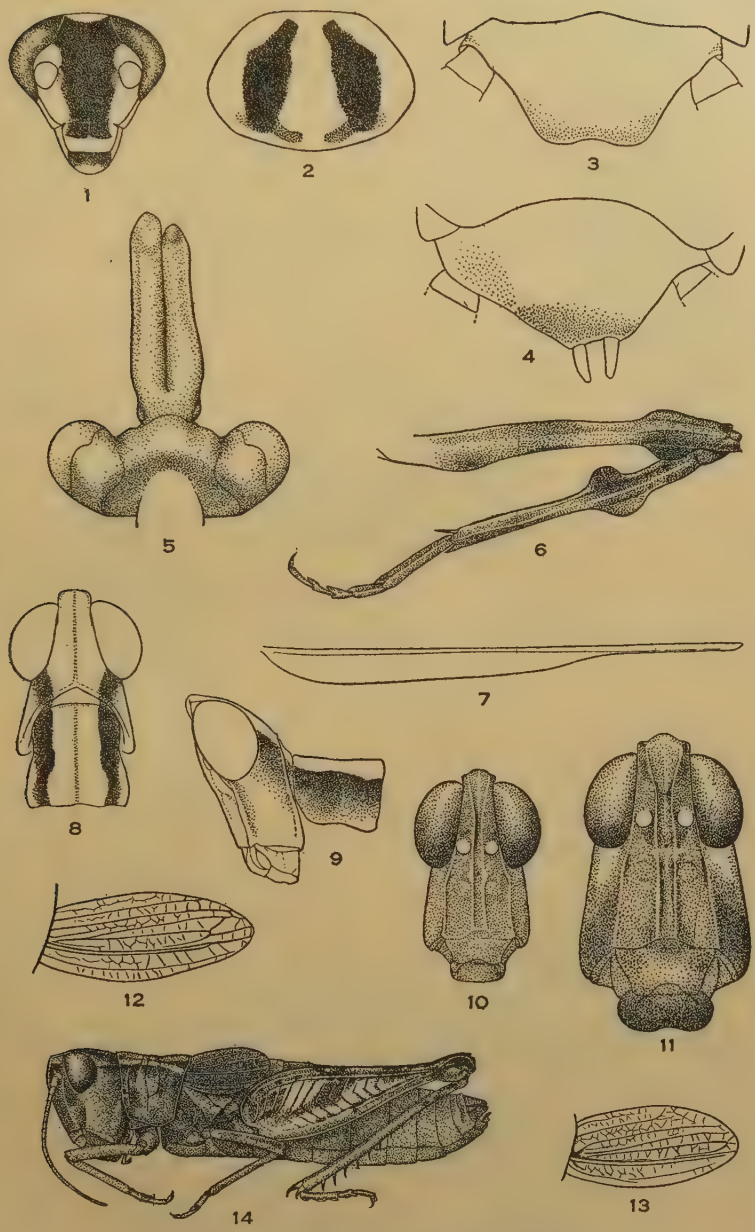
Fig. 4.—*Pristoceuthophilus arizonae* new species. Lateral (external) view of caudal limb of male. *Type*. North slopes of Santa Catalina Mountains, near Oracle, Arizona. (X 3⅗.)

Fig. 5.—*Pristoceuthophilus arizonae* new species. Caudal view of chitinized portion of male pseudosternite. *Paratype*. North slopes of Santa Catalina Mountains, near Oracle, Arizona. (Greatly enlarged.)

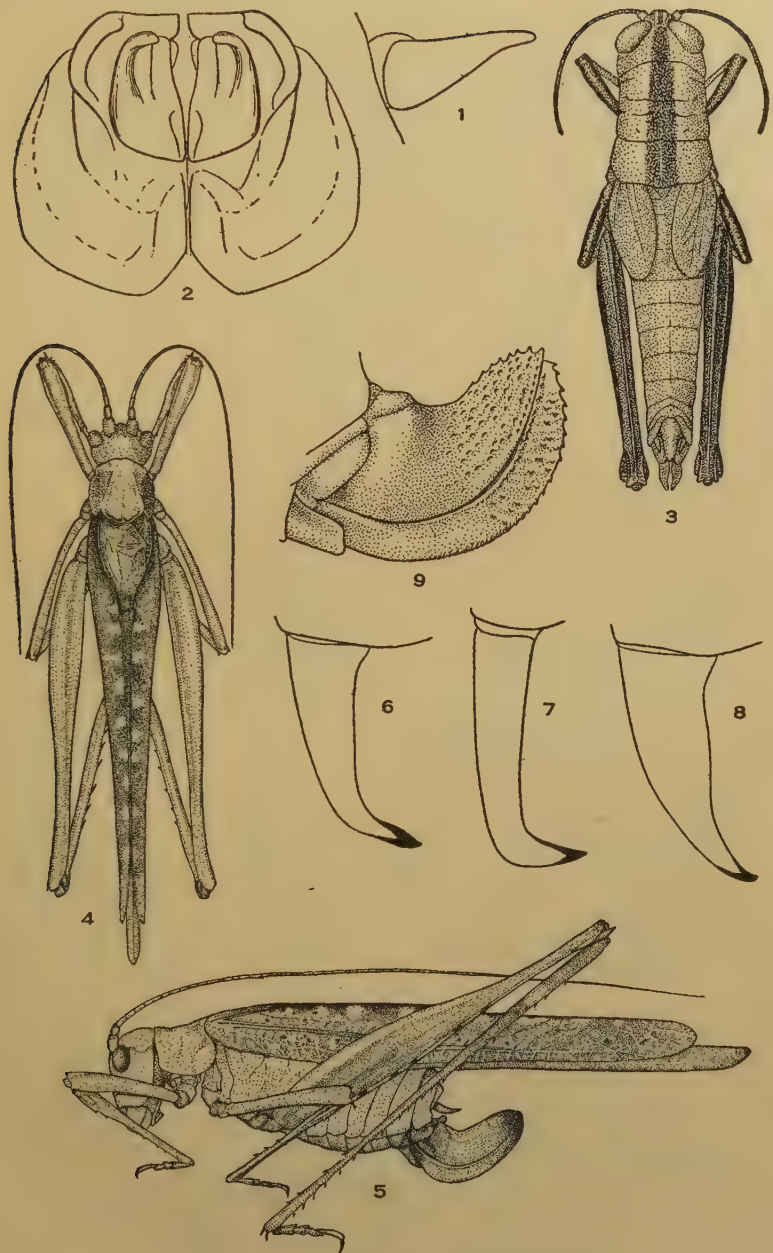
Fig. 6.—*Gryllodes arizonae* new species. Dorsal view of male. *Paratype*. Hendricks Canyon, Baboquivari Mountains, Arizona. (X 3).

Fig. 7.—*Gryllodes arizonae* new species. Dorsal view of female. *Paratype*. South slopes of Atascosa Peak, Pajaritos Mountains, Arizona. (X 3.)

Fig. 8.—*Gryllodes arizonae* new species. Lateral view of distal portion of ovipositor. *Paratype*. South slopes of Atascosa Peak, Pajaritos Mountains, Arizona. (X 3.)



HEBARD—ARIZONA ORTHOPTERA



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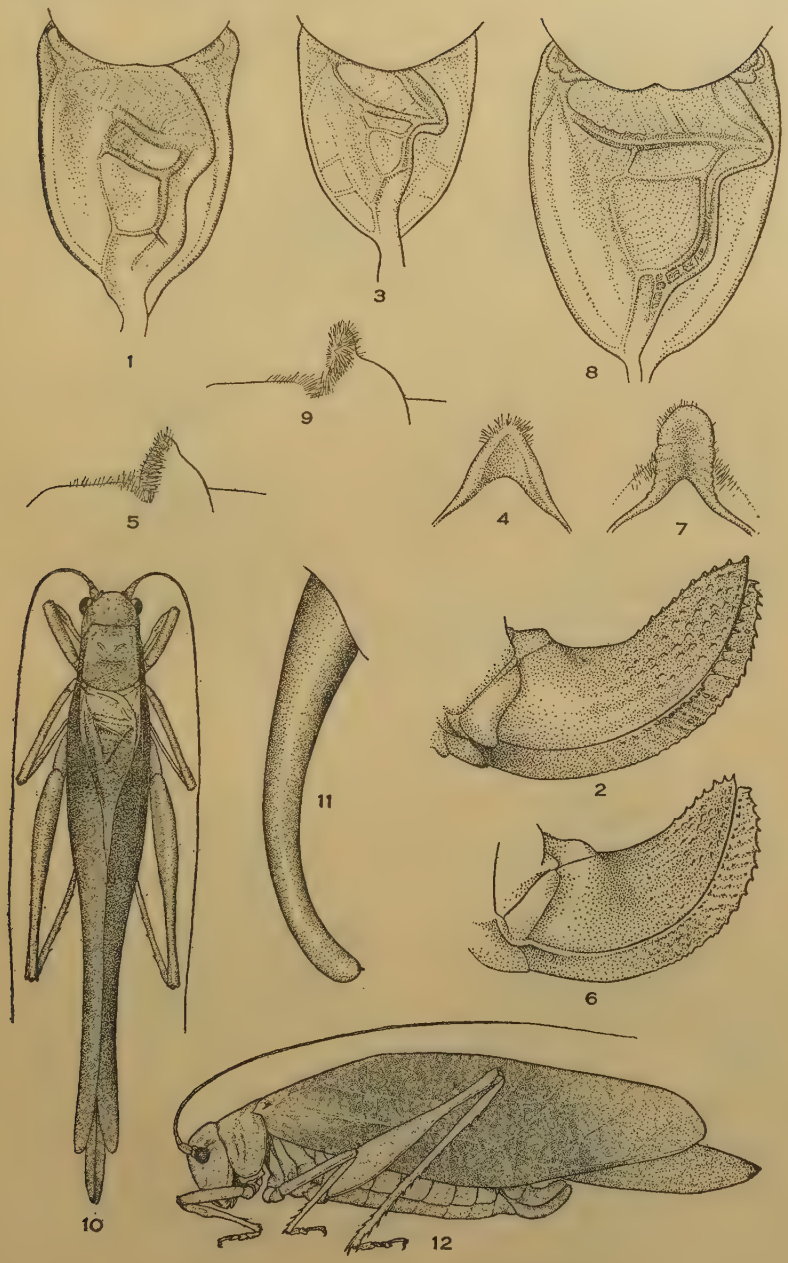

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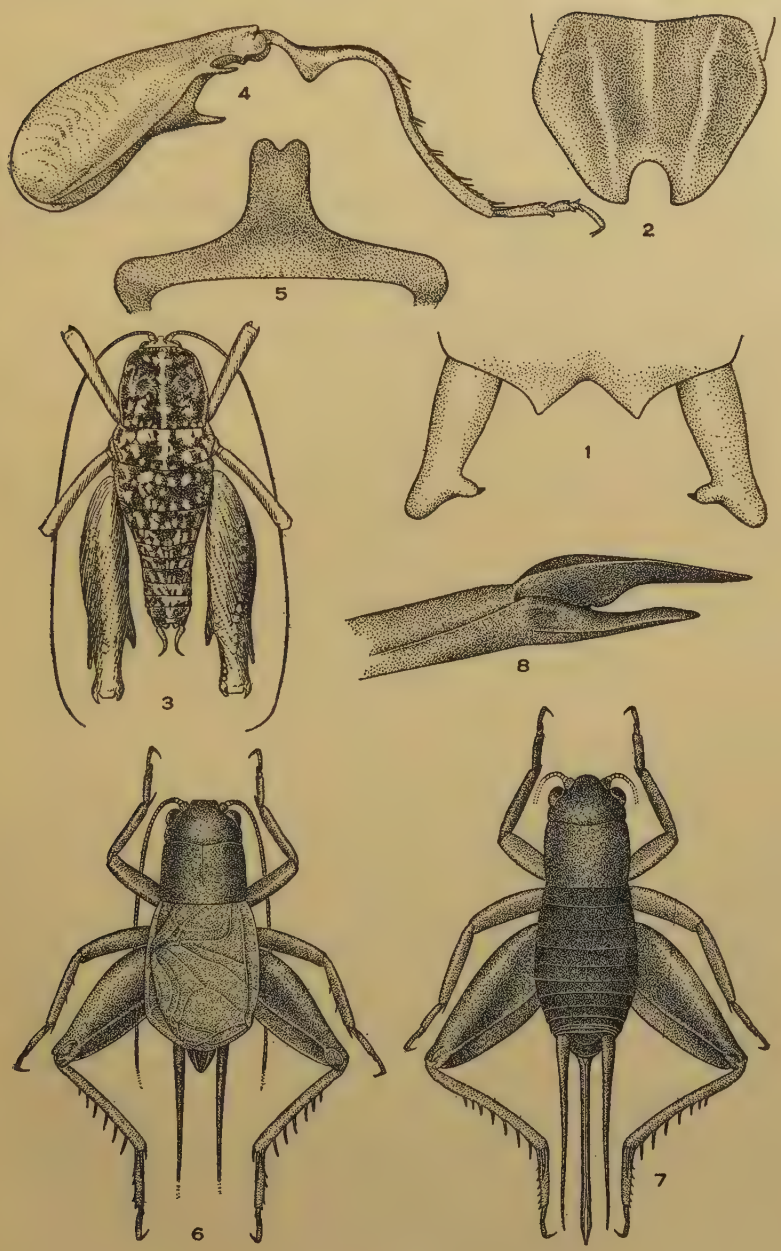

HEBARD—ARIZONA ORTHOPTERA

A REVISION OF THE GENUS MEGACHILE IN THE NEARCTIC REGION [1]

PART III [2]

TAXONOMY OF SUBGENERA ANTHEMOIS AND DELOMEGACHILE

(Hymenoptera: Megachilidae)

BY THEODORE B. MITCHELL

(Plates VIII–IX)

Subgenus **ANTHEMOIS** Robertson

Megachile (subgenus) Friese, Die Bienen Europa's, Th. 5, p. 35, 1899.
Anthemois Robertson, Trans. Am. Ent. Soc., XXIX, p. 168, 1903. Mitchell, Trans. Am. Ent. Soc., LIX, p. 300, 1934.
Cyphopyga Robertson, Trans. Am. Ent. Soc., XXIX, p. 169, 1903.
Megachile (s. str.) Robertson, Ent. News XXXV, p. 374, 1924.

Tongue: First and second joints of labial palpus subequal, or the second slightly longer than the first; maxillary palpi only very finely pubescent, the third joint usually slightly longer than the others.

Female.—Mandible 5-dentate (very obscurely so in *montivaga*), with an incomplete cutting edge between the second and third teeth (except in *montivaga*); basal joint of flagellum slightly longer than either the pedicel or the second joint, these latter subequal; metatarsi distinctly shorter and narrower than their tibiae; claws with rather robust basal setae which are tooth-like in appearance; abdomen ovoid, the sixth tergum usually straight in profile, with at least a slight amount of erect pubescence toward the base; sixth sternum more or less bare toward the apex, but without a definite bare apical lip.

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[1] Contribution from the Department of Zoology and Entomology, North Carolina State College, published with the approval of the Director of the North Carolina Experiment Station as Paper no. 83 of the Journal Series.

[2] Parts I and II. Trans. Am. Ent. Soc., LIX, pp. 295-361, (1934); LXI, pp. 1-44, (1935).

Male.—Mandible 3-dentate, the inferior projection subbasal, usually relatively slender; first and second joints of flagellum subequal, each at least slightly longer than the pedicel; cheeks usually simple and unmodified below (slightly protuberant in *inermis*); front coxae at least thinly pubescent anteriorly, without red bristles, and the spines either entirely lacking or represented by mere dentiform angles; front tarsi simple and unmodified; mid tibia with the usual apical spur; claws without basal teeth; carina of sixth tergum short, usually with a shallow median emargination, but this irregular and often obscure; seventh tergum usually quite conspicuous.

Male sternites: Fourth sternum exposed; fifth sternum divided into distinct pre- and medasternites, but the poststernal strip often obscure, the medasternal setae usually simple, though often robust or recurved; sixth sternum without a distinct poststernal lobe, the medasternal areas more or less definitely delimited, with simple but usually robust and recurved setae.

Genital armature: Stipites somewhat dilated toward the apex, but the tips more or less acute, often constricted, otherwise unmodified, the base of each with a rather conspicuous dorsal protuberance; sagittae robust, with broad dorsal and narrow ventral surfaces, tips slightly surpassing the stipites.

GENOTYPE: *Megachile centuncularis* Linneus (*infragilis* Cresson). [Orthotype.]

Anthemois is a Holarctic group, being represented in the Palaearctic region by *centuncularis, ligniseca, versicolor, pilicrus, melanopyga* and possibly others.

Various references have been made to the nesting habits of species of this group. The list of references to *centuncularis* is extensive, and considerable concerning its habits in Europe has been published. The first reference to it in America is that by Gentry[3] who reared specimens from nests dug from the soil and identified them as *centuncularis.* He also found leafy cells in mud nests plastered to the rafters of a house, much like the nests of the muddauber (*Sceliphron*), and attributed these to the same species. It is very doubtful however that both of these nests were built by the same species, and it is quite possible that his identification of the bees reared was erroneous. He does not make it clear whether the masonry nests were constructed by the bees or merely appropriated by them, but it is probable that he had no means of determining that fact. It seems more likely that the

[3] Can. Ent., VI, pp. 171-175, (1874).

nests had been appropriated, as there are no records of Nearctic species of *Megachile* which construct such nests.

Provancher[4] published some notes on the nests of "*centrunculus*", but as so many of his determinations were erroneous, it is doubtful that the information should be applied to *centuncularis*. Packard[5] also published a note on the type of nest constructed by *centuncularis*, but gives nothing concerning the situation ordinarily chosen by it. Later[6] he described and figured the larva and pupa of a bee attributed to *centuncularis*.

More recently Sladen[7] has described the nest of *inermis* as occurring in rotting apple wood, and he states that *ligniseca*, a related Palaearctic species, usually constructs its nest in decayed wood.

Hicks[8] has made observations on three species of *Anthemois*. A specimen of *centuncularis* (*infragilis*) was reared from a nest located in the dead stem of a tree or bush, the cells of the nest being constructed of leaves. A number of nests of *montivaga* were observed, these also in old plant stems, especially those which had been broken, exposing the pithy center into which the bees apparently burrowed. Petals were used for the most part in the construction of the cells, although pith was also employed in plugging the open ends of the cells after they had been provisioned. A nest of *relativa* was found in a tunnel in a bank, and was constructed of rose leaves.

A specimen of *relativa* caught by Professor Brues in Petersham, Massachusetts, had possibly been nesting in logs cut for firewood, as it was found at the window of the shed in which the wood was stored.

It would appear from these observations that the species of *Anthemois* are but slightly if at all specialized as to the nesting sites they select, being nearly as variable in this respect as *Litomegachile*.

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[4] Nat. Canad., IX, pp. 23 and 95, (1877).

[5] Psyche, VI, p. 340, (1892).

[6] Journ. N. Y. Ent. Soc., V, p. 109, (1897).

[7] Can. Ent., LI, p. 125, (1919).

[8] Univ. Colo. Stud., (15), III, pp. 321-322, (1926).

Key to Species of Anthemois

Females

1. Pubescence of sixth segment of abdomen abundant long and erect, visible in profile.....2
   Sixth segment of abdomen showing only very short suberect or appressed pubescence in profile.....3
2. Pubescence of sixth tergum entirely dark.....*centuncularis* Linneus
   Sixth tergum with appressed golden tomentum.....*relativa* Cresson
3. Sixth tergum concave in profile.....*montivaga* Cresson
   Sixth tergum straight in profile.....4
4. Scopa on fifth and sixth segments black; clypeus subemarginate medially, with no lateral emarginations.....*nivalis* Friese
   Scopa entirely ochraceous; clypeal margin with rather deep lateral emarginations.....*inermis* Provancher

Males

1. Abdomen almost impunctate; lateral ocelli much nearer each other than to edge of vertex; larger (13 mm. or more).....*inermis* Provancher
   Punctures of abdomen distinct; smaller.....2
2. Clypeal margin with a distinct median tubercle; surface of sixth segment polished above carina, the punctures distinctly separated. *relativa* Cresson
   Clypeal margin not tuberculate; surface of sixth segment more closely punctate or tuberculate.....3
3. Coxal spines represented by dentiform tubercles; carina of sixth segment usually with a definite median emargination, apical margin of the segment with conspicuous carinate median teeth and spine-like lateral teeth, surface above the carina dull, minutely rugoso-punctate. *montivaga* Cresson
   Coxal spines entirely lacking; carina of segment six with an obscure median emargination, the apical margin of the segment with triangular median teeth and obscure lateral teeth, the surface above the carina with numerous small tubercles, the punctures very obscure. *centuncularis* Linneus

Megachile (Anthemois) centuncularis Linneus (Pls. VIII and IX)

Apis centuncularis Linneus, Syst. Nat., ed. 10, p. 575, 1758.

Megachile centuncularis Latreille, Hist. Nat. Crust. & Insect., III, p. 382, 1802. Packard, Am. Nat., I, T. 10, F. 8 & 9, 1867. Gentry, Can. Ent., VI, p. 171, 1874. Provancher, Nat. Can., XIII, p. 230, n. 10, 1882 (= *Megachile vidua*). Provancher, Faun., Ent. Can. Hym., p. 714, 1883 (=*Megachile vidua*). Packard, Psyche, VI, p. 340, 1892. Dalla Torre, Cat. Hym., X, p. 423, 1896. Packard, Journ. New York Ent. Soc., V, p. 109, 1897. Robertson, Ent. New, XXXV, p. 374, 1924.

Megachile centrunculus Provancher, Nat. Can., VII, p. 58, 1875. Provancher, Nat. Can., IX, p. 23 & 95, 1877.

Megachile infragilis Cresson, Trans. Am. Ent. Soc., VII, p. 127, 1878. Friese, Das Tierr. Lfg. 28, Apidae I, p. 239, 1911. Cockerell, Can. Ent., XLIII, p. 33, 1911. Cresson, Mem. Am. Ent. Soc., 1, p. 120, 1916. Mitchell, Psyche, XXXIII, p. 163, 1926. Hicks, Univ. Colo. Stud., (15), III, p. 231, 1926.

Osmia frigida Provancher, Nat. Can., XIV, p. 37, 1883. Provancher, Add. Faun. Can. Ent. Hym., p. 325, 1888.

Anthemois infragilis Robertson, Trans. Am. Ent. Soc., XXIX, p. 172, 1903. Titus, Proc. Ent. Soc. Wash., VII, p. 152, 1905.

Megachile leoni Titus, Proc. Ent. Soc. Wash., VII, p. 150, 1905.

Megachile relativa Cockerell, Can. Ent., XLIII, p. 33, 1911.

Megachile (*Anthemois*) *infragilis* Viereck, Conn. Nat. Hist. Surv. Bull. 22, p. 742, 1916.

Female.—Size: Length 10 to 11 mm.; breadth of abdomen 3.5 to 4 mm.; anterior wing 7.5 to 8 mm.

Structure: Face with length and breadth equal; eyes slightly convergent below; clypeus convex above, the margin subentire, with an indistinct median shining area; mandibles distinctly 5-dentate; lateral ocelli slightly nearer edge of vertex than to eyes; vertex nearly flat; cheeks slightly broader than eyes; second and third segments of abdomen with shallow basal grooves, the fourth less distinctly grooved, apical margins of the third to the fifth rather obscurely depressed laterally, the sixth narrowly truncate apically, straight in profile, with abundant erect pubescence visible in profile.

Puncturation: Close and quite fine on face, cheeks below, pleura above, and mesonotum and scutellum laterally; somewhat more coarse but close on clypeus laterally, vertex and scutellum medially, and on pleura below; somewhat more sparse on clypeus medially, vertex laterally, and in center of mesonotum; minute and close on abdomen basally, becoming more distinct but still fine and rather close toward the fifth segment, but very fine and close on the sixth.

Color: Black, antennae piceous or black; tegulae dark ferruginous or piceous; wings uniformly and very faintly smoky, not appreciably darker apically, the nervures dark ferruginous to piceous; spurs yellowish-ferruginous.

Pubescence: Largely pale ochraceous on head, thorax, legs and the first and second abdominal segments, but vertex with conspicuous fuscous pubescence, the mesonotum and scutellum with intermixed fuscous and ochraceous hairs; black on third to sixth segments, the second to the fifth with pale apical fasciae evident laterally, sometimes entire on the fifth, the sixth entirely lacking pale tomentum; scopa entirely ochraceous or pale fulvous.

Male.—Size: Length 8 to 9 mm.; breadth of abdomen 2.5 to 3 mm.; anterior wing 6 to 7 mm.

Structure: Face about as broad as long; eyes slightly convergent below; clypeal margin slightly outcurved, without a definite median tubercle; inferior mandibular projection narrowly rounded or truncate at tip; lateral ocelli subequally distant from eyes and edge of vertex; vertex flat; cheeks subequal in width to eyes; front coxae thinly pubescent anteriorly, the spines entirely lacking; second and third segments of abdomen deeply grooved basally, the apical margins of the second to the fifth somewhat depressed, entirely and rather abruptly so on the fourth and fifth, but only laterally on the second and third; sixth tergum almost ventral in position, the carina low, only very indefinitely emarginate medially, this emargination often entirely inevident, but the carina then irregularly crenulate, median teeth of apical margin of the tergum just barely evident, the lateral ones very obscure; seventh tergum rather robust, broadly triangular or transverse, not distinctly excavated.

Sternites: Fifth presternite extensive, only moderately constricted medially, with an apical patch of setae on each side, the medasternite small, its basal margin broadly rounded, the surface densely setose, the poststernite barely evident, slightly produced laterally, confined to the apical margin of the medasternite; sixth presternite with its lateral portions broader than long, each with a large apical patch of setae, the medasternal areas very slightly broadened medially, rather densely setose, the poststernite barely evident, fringed medially with a few minute setae.

Genital armature: Stipites robust, with a slight dorsal projection basally, the apical half flexed ventrally, somewhat dilated, minutely setose on the inner face, the tip abruptly reflexed; sagittae broad basally, constricted apically, the tips slightly compressed, slightly exceeding the tips of the stipites; volsellae laterally compressed, subacute from the ventral aspect.

Puncturation: Close and moderately fine on cheeks, face, pleura, scutellum, and over a large part of the mesonotum; slightly more coarse but still quite close on vertex and mesonotum medially, becoming quite distinctly separated on vertex laterally; rather close over most of abdomen, minute and indistinct basally, becoming slightly more coarse and distinct toward the fifth segment, the sixth almost impunctate, but with numerous minute tubercles.

Color: Black; antennae piceous or black; tegulae deep ferruginous or piceous; wings subhyaline or very slightly infuscated basally, somewhat more deeply so apically, the nervures piceous; spurs yellow.

Pubescence: Pale ochraceous over most of head, thorax, legs and the first and second segments of the abdomen, but vertex, mesonotum and scutellum with long conspicuous fuscous pubescence, more or less intermixed with pale hairs; black on third to fifth segments, these with pale ochraceous apical fasciae, usually entire on the fifth, more or less

interrupted on the others, the second to the fourth with slight amounts of ochraceous tomentum basally, the sixth with thin long erect pale pubescence, sometimes intermixed with dark hairs.

Range.—This species is Holarctic in distribution, no differences having been found between the North American form described under the name *infragilis* and the European form generally accepted as *centuncularis*. In North America it extends from coast to coast, and scattered records indicate its occurrence as far south as Florida, although it is typically more northern in distribution. The records are numerous, to which the following list of localities in North America will testify:

CONNECTICUT: 1♂, 1♀, Hartford, May 30 & Aug. 6, 1893 & 1894.

DISTRICT OF COLUMBIA: 2♀, Aug 15 & 20, 1880, (C. V. Riley). 1♂, Washington, Aug. 1, 1917, (R. Fonts; on composite flower).

ILLINOIS: 2♀, no locality record. 2♂, 2♀, Algonquin, 1♂, 1♀, Peoria, July 10 & 16. Identified also from Chicago and McHenry (Aug.).

IOWA: 1♀, no locality record.

MAINE: 2♀, no locality record. 1♂, Waldoboro, July 14, 1898, (Lot 231; on *Sedum*). Identified also from Bar Harbor, Capens, Fort Kent, Mt. Desert, and S. W. Harbor.

MARYLAND: 1♂, Chestertown, July 3, 1906, (E. G. Vanatta).

MASSACHUSETTS: 1♂, Boston, June 10, 1925. 1♂, Fairhaven, June 27, 1926, (Mitchell). 3♂, Forest Hills, June 24, 1926, (on *Trifolium*), and June 25, 1921. 1♀, Forest Hills, Aug. 8, 1926, (all Mitchell). 1♂, Southampton, July 11, 1894. Also identified from Brookline, Great Barrington, and Rutland.

MISSOURI: 1♀, no locality record.

NEBRASKA: 1♂, Lincoln, May. 1♂, 1♀, Lincoln, July 15 & 16, 1913, (J. T. Zimmer). Also identified from Child's Point, Neligh, and Omaha.

NEVADA: 1♂, no locality record.

NEW JERSEY: 2♀, Ocean Grove, July 9 & 12, 1893, (one labelled *M. mendica,* det. Ashmead). Identified also from Ramsey (June-Aug.).

NEW YORK: 1♀, no locality record. Identified from Ithaca, McLean, Rochester, Roslyn, and Sea Cliff.

ONTARIO: 1♂, Ottawa, June 7, 1914, (F. W. L. Sladen). 1♀, Toronto. Also identified from Bobcaygeon, and Guelph.

PENNSYLVANIA: 4♂, 1♀, no locality record. 2♂, 1♀, Philadelphia. Also identified from Alleghany, Harrisburg, and Melch.

SOUTH DAKOTA: 2♀, Brooklings, Aug. 21, 1924.

Specimens not now at hand have been identified from the following localities: Colorado—Boulder, Denver, and Platte Canyon; Florida—Enterprise and St. Augustine (January); Idaho — Warren; Indiana —

Anderson and Vincennes (June); Michigan — Agricultural College, Constantine, and Flint; Minnesota — Minneapolis (June-September); New Hampshire—Base Station at Mt. Washington; North Dakota—Bismark, Dickinson, Fargo, and Kulm; Nova Scotia — Kentville, Nappan, and Pictou; Ohio—Put-in-Bay (July); Quebec—Hull and Quebec; Vermont—Rutland (August); Virginia—Falls Church and Glen Carlyn; Washington — Mt. Ranier (July) and Pullman; Wisconsin — Cranmoor (June) and Milwaukee: Wyoming—Sheridan.

Flower records.—This species is apparently very generalized in its flower visiting habits, although the compositae seem to be favored, as the following list will show: *Althaea rosea, Psorelea, Medicago sativa, Melilotus alba, M. officionalis, Centaurea jacea,* (cult.), *C. cyanus* (cult.), *Carduus undulatus, Grindelia squarrosa, Helianthus annuus,* (cult.), *H. maximiliana, Inula helenium, Taraxacum taraxacum,* and *Verononia fasciculata.*

Megachile (Anthemois) relativa Cresson (Pls. VIII and IX)

Megachile relativa Cresson, Trans. Am. Ent. Soc., VII, p. 126, 1878. Robertson, Trans. Ac. St. Louis, VII, p. 351, 1897. Cockerell, Ann. Mag. Nat. Hist., (7), VI, p. 11, 1900. Viereck, Trans. Am. Ent. Soc., XXIX, p. 48, 1903. Titus, Proc. Ent. Soc. Washington, VII, p. 149, 1905. Cockerell, Univ. Colo. Stud., IV, p. 253, 1907. Friese, Das Tierr. Lfg., 28, Apidae I, p. 245, 1911. Cockerell, Can. Ent. XLIII, p. 33, 1911 (=*centuncularis*). Cresson, Mem. Am. Ent. Soc., I, p. 129, 1916. Mitchell, Psyche, XXXIII, p. 163, 1926. Hicks, Univ. Colo. Stud., (15), III, p. 231, 1926. Mitchell, Psyche, XXXIV, p. 179, 1927.

Megachile optiva Provancher, Nat. Canad. XIII, p. 232, 1882. Provancher, Faun. Canad. Hym., p. 715, 1883.

Megachile (*Xanthosarus*) *exclamans* Viereck, Conn. Nat. Hist. Surv. Bull. XXII, p. 742, 1916.

Megachile aspera Mitchell, Journ. Elisha Mitchell Soc., XL, p. 158, 1924.

There has been some confusion between this species and *centuncularis* (*infragilis*), Robertson indicating them as being the same (1897). Although they are very close they are certainly distinct. The female of *relativa* may be easily distinguished by the appressed golden tomentum of the sixth tergum and by the slightly different clypeal margin. In the male of *relativa* the clypeal margin beneath the pubescence has a rather robust median tubercle which is entirely lacking in *centuncularis*. Other differences will be noticed if the figures of the male sternites and genital armatures are compared.

Female.—Size: Length 9 to 12 mm.; breadth of abdomen 3 to 3.5 mm.; anterior wing 6.5 to 8 mm.

Structure: Length and breadth of face equal; eyes very slightly convergent below; clypeal margin with a shallow median emargination, very slightly crenulate on each side; mandibles distinctly 5-dentate; lateral ocelli slightly nearer edge of vertex than to eyes; vertex flattened; cheeks broader than eyes; second and third segments of abdomen slightly grooved across base, the fourth less distinctly so, apical margins of the second to the fifth slightly depressed laterally, but not so medially, apex of sixth narrowly truncate, straight in profile, with abundant erect hairs visible in profile.

Puncturation: Fine and close on face, on clypeus laterally, and at extreme sides of mesonotum and scutellum; more coarse and distinct, though rather close, on cheeks, vertex and clypeus medially, and on pleura and scutellum, becoming quite sparse, coarse and deep on vertex laterally and mesonotum medially; minute and indistinct on abdomen basally, becoming more distinct, but fine and rather sparse toward the fifth tergum, very fine and close on the sixth.

Color: Black; antennae and tegulae piceous or black; wings subhyaline or faintly smoky basally, more distinctly clouded apically, the nervures piceous; spurs yellowish-ferruginous.

Pubescence: Black and rather long and dense on vertex, mesonotum and scutellum, and black also, though much shorter on second to fifth segments of abdomen; otherwise greyish-white on head, thorax, basal leg joints and basal segment of abdomen; more ochraceous on the apical leg joints; second to fifth segments of abdomen with entire ochraceous apical fasciae, the sixth with appressed golden tomentum and erect hairs which vary in color from ochraceous to black; scopa entirely ochraceous or pale fulvous.

Male.—Size: Length 8 to 10 mm.; breadth of abdomen 2.7 to 3 mm.; anterior wing 6.5 to 7.5 mm.

Structure: Length and breadth of face subequal; eyes slightly convergent below; clypeal margin with a rather robust median tubercle; inferior mandibular projection slender, more or less rounded apically; lateral ocelli nearer edge of vertex than to eyes; vertex slightly rounded; cheeks slightly broader than eyes; front coxae thinly pubescent anteriorly, the spines absent; second to fourth segments of abdomen rather deeply grooved basally, the apical margins of the second to the fifth more or less deeply depressed, more so laterally and on the more apical segments, not at all depressed on the second tergum medially; sixth tergum vertical in position, the carina very low, with a more or less definite median emargination, the median carinate teeth of the apical margin nearer the acute lateral teeth than to each other; seventh tergum robust, very broadly triangular, concave back of apex.

Sternites: Lateral portions of fifth presternite extensive, although almost completely separated by the median triangular emargination, each side with an apical patch of setae, the medasternite small, its basal margin broadly rounded, the surface finely setose, the poststernal strip narrow medially, but considerably produced along the margins of the presternite; lateral portions of sixth presternite narrow, each with a small apical patch of setae, the sternum slightly broadened medially, the medasternal areas represented by sparsely setose areas on each side on middle, the poststernite inevident.

Genital armature: Stipites slender, each with a large and conspicuous dorsal protuberance basally, apical half evenly curved, slightly dilated just above the median constriction, minutely setose along the inner face, the tips acute; sagittae broad medially, slightly narrowed both basally and apically, the tips rounded and much exceeding the tips of the stipites; volsellae slightly compressed laterally, with tips rounded in the ventral aspect.

Puncturation: Close and rather fine on cheeks, face, pleura, scutellum and on mesonotum in large part; slightly more coarse and distinct on vertex and mesonotum medially, still more coarse and more widely separated on vertex laterally; minute and indistinct on abdomen basally, slightly more distinct and rather close toward the fifth segment, the more apical terga shining, more coarse but shallow on the sixth in the region of the carina, finer and more close basally.

Color: Black; antennae and tegulae piceous or black; wings faintly smoky, very slightly darker apically, the nervures piceous; apical tarsal joints more or less ferruginous; spurs yellowish-ferruginous.

Pubescence: Black or fuscous, long and dense on vertex and mesonotum, intermixed black and pale on scutellum, with some black on cheeks above and behind eyes; otherwise pale ochraceous or whitish on head, thorax, legs, and basal segments of abdomen; black and rather short on third to fifth segments of abdomen, the second either entirely pale pubescent or with a slight amount of dark pubescence laterally, the sixth with scattered erect hairs which are mostly pale.

Type.—Female; Colorado, [A.N.S.P., no. 2447].

Range.—The known range of this species extends from North Carolina west to New Mexico and California and northward throughout Canada, to Mackenzie and Newfoundland, and is in flight throughout the warm season. Detailed records are as follows:

British Columbia: 1♀, no locality record. 1♂, Carbonate, July 12, 1908. Identified also from Kaslo, Oliver, Peachland, and Vernon.

CALIFORNIA: 1♂, 1♀, Lake Tahoe, Aug. 21 & 22, 1916, (L. Bruner). Also identified from Alta Meadow.

CANADA: 1♀, no locality record.

COLORADO: 5♂, 3♀, no locality record. 2♀, Aspen, July 24-27, 1919. 1♂, Boulder, June 1, 1908, (S. A. Rohwer; on *Besseya plantagineae*). 1♂, Boulder, Feb. 8, 1926, (bred ?; Hicks). 1♀, Boulder County, Canadian Zone, Aug. 25, 1907, (S. A. Rohwer; on golden aster). 2♂, 11♀, Boulder County, July 12 to Aug. 2, (C. P. Custer). 2♂, 5♀, Boulder County, July 18 to Sept. 4, 1925, (Hicks). 1♂, Hubbard Ranch, Elbert, June 9, (Figgins; on *Gilia*). 3♀, Pingree Park, Aug. 15, 1932, (Helen James). 1♂, Silver Plume, July 10, 1897, (on *Senecio*). 1♀, Tennessee Pass, Aug. 6-8, 1920. 1♂, 2♀, Ute Creek, 9000 ft. July 3 & 28, Aug. 5, (L. Bruner and R. W. Dawson). 3♀, Ward, Aug. 11 & 26, 1913, (Cockerell), and Aug. 8-10, 1919. Also identified from Bierstadt, Chimney Gulch, Colorado Springs, Cornet Creek, Creede, Denver, Leadville, Manitou Park, Ouray, Pikes Peak, Pingree Park, Sierra Blanca, South Fork of Rio Grande, Telluride, and Tolland.

CONNECTICUT: 2♂, 2♀, Hartford, June 3, 1894 and Aug. 13, 1897, (on *Verbena* and *Solidago*). Identified also from Colebrook, June and August.

GEORGIA: 1♂, no locality record.

IDAHO: 1♂, 2♀, Coolin, Priest Lake, July 21-24, 1927, (E. C. VanDyke). Also identified from Moscow (July).

ILLINOIS: 1♀, Matteson, Sept. 7, 1932. 1♂, Palos, June 4, 1932. 1♀, Volvo, Aug. 2, 1930; (all Pearson). Identified also from Antioch.

IOWA: 1♀, Ames, (E. D. Ball; lot 220).

MAINE: 1♂, 2♀, Saco, June 7, 1921, (on *Rubus*), June 17, 1925, (on *Rhodora*), and Sept. 7, 1926, (on *Solidago*); (all Mitchell).

MASSACHUSETTS: 1♂, 2♀, Forest Hills, June 12 & 20, 1926, (on *Rudbeckia hirta*), and Aug. 20, 1917. 7♂, 3♀, Needham, May 31, 1921, June 20, 1921, and June 9-17, 1925, (on *Rubus, Trifolium, Apocynum,* and *Geranium*); (all Mitchell). 1♀, Riverside, Oct. 1. Also identified from Eastport, Holliston, Peabody, and Wayland.

MICHIGAN: 6♂, 2♀, Baraga County Barrens, July 18 & 20, 1903. 5♂, 6♀, Pequaming, July 1 to Aug. 17. 2♂, Point Abbaye, July 20 & 31, 1903; (all Morgan Hebard). 1♂, Lansing, (Geo. Dimmock), 1♀, Spaulding, July 24, 1932, (J. Pearson). Identified also from Douglas Lake, Grand Rapids, and Wakefield.

MONTANA: 3♂, no locality record. Identified from Beaver Creek and Helena (August).

NEVADA: 1♂, 2♀, no locality record.

NEW HAMPSHIRE: 1♂, no locality record. 3♀, Lancaster, Aug. 24-29, 1928, (Timberlake; on *Aster umbellatus, A. punicus,* and *Prenanthes* sp.). Also identified from Durham.

NEW MEXICO: 1♂, Beatty's Cabin, Aug. 2, (W. P. Cockerell). 1♀, Beulah, June 29, (W. P. Cockerell; on *Frasera*). 1♂, Beulah, June 29, 1902, (on white watercress). 5♂, Cloudcroft, May 23 & 27, June 18, 1902. 1♂, Rociado, Aug. 20, (Cockerell).

NORTH CAROLINA: 3♂, 3♀, Cruso, June 24-28, 1934, (on *Chrysanthemum leucanthemum*). 1♀, Busick, Sept. 1, 1929. 4♂, 2♀, Mt. Pisgah, June 23, 1934, (on *Houstonia purpurea*). 1♂, 1♀, Mt. Mitchell, Aug. 24, 1933. 1♀, Sunburst, June 26, 1934; (all Mitchell). 1♀, Jefferson, Sept., 1912, (C. L. Metcalf), (described as *Megachile aspera* n. sp., Mitchell, 1924).

ONTARIO: 5♀, Macdiarmid, Lake Nipigon, Aug. 12-15, 1922 and July 30, 1923, (N. K. Biglow). Also identified from Cochrane, Ottawa, Sudbury, and Thousand Islands.

OREGON: 1♂, Alsea Mount, July 4, 1930, (J. Wilcox). 1♀, Antelope Mt., Harney County, 6500 ft., Aug. 14, 1931 (B. K. Frewing). 1♂, McKenzie Bridge, Aug. 10, 1925, (G. A. McGinnis). 1♂, Mt. Hood, 3000-6000 ft., June 25, 1925, (E. C. VanDyke). Also identified from Corvallis and Wahtum Lake.

QUEBEC: 2♀, Lanoraie, Sept. 3, 1925, (W. L. Buckle). Also identified from Brome County, Fort Coulonge, Hull, Montfort, Montreal, St. Hilaire, and St. Martin.

SOUTH DAKOTA: 2♀, Custer. 1♂, 1♀, Harney's Peak, July 21, 1924.

UTAH: 1♀, Ogden, Aug. 29-30, 1916.

WASHINGTON: 1♂, 2♀, no locality record. 1♂, Olympia, June 9, 15, & 19, 1895, and June 27, 1896. 3♂, Seattle, July 1, 1894. Also identified from Mt. Ranier and Wawawai.

WYOMING: 2♂, Jackson, July 13-17, 1920. 1♂, Stewart R. Sta., July 18, 1920. Also identified from Bridge Basin and Sheridan.

Specimens of *relativa* have been identified also from the following localities: Alberta — (June-August), Banff, Bilby, Calgary, Cypress, Edmonton, Lethbridge, Regina, and Slave Lake; Arizona — Oak Creek Canyon (August); Mackenzie—Fort Providence and Fort Simpson; Manitoba—Teulon; Maryland—Cabin John; Minnesota—Pelican Lake and Wahkon; Newfoundland—Spruce Brook (August); New Jersey; New York—Ithaca and Rochester; North Dakota—Fargo, Grand Forks, Lisbon, and Turtle Mts.; Pennsylvania; Vermont—Jay; Wisconsin—Clark County (July) and Cranmoor.

Flower records.—This species has a wide range in its flower visiting habits, having no apparent limitations or preferences unless it be for composites. In addition to numerous compositae, the list includes species of *Rubus, Brassica, Physallis, Melilotus, Zizia, Ranunculus, Trifolium, Rosa, Geranium, Houstonia, Rhodora,* and *Epilobium.*

Megachile (Anthemois) montivaga Cresson (Pls. VIII and IX)

Megachile montivaga Cresson, Trans. Am. Ent. Soc., VII, p. 124, 1878. Cockerell, Can. Ent., XXXV, p. 215, 1903. Cockerell, Univ. Colo. Stud., IV, p. 254, 1907. Friese, Das Tierr. Lfg. 28, Apidae I, p. 241, 1911. Cresson, Mem. Am. Ent. Soc., I, p. 125, 1916. Hicks, Univ. Colo. Stud., (15), III, p. 232, 1926.

Cyphopyga montivaga Robertson, Trans. Am. Ent. Soc., XXIX, p. 172, 1903.

The genus *Cyphopyga* was erected to include this single species, and while it shows some differencies from the other species included here in *Anthemois,* those differences appear to be more specific than generic or subgeneric in value. The character of the hidden male sternites and genital armature especially is indicative of the kinship of *montivaga* to the other species of *Anthemois.*

Female.—Size: Length 11 to 13 mm.; breadth of abdomen 3 to 4 mm.; anterior wing 8 to 9 mm.

Structure: Face about as broad as long; eyes very slightly convergent below; clypeus quite distinctly convex above, the apical margin almost straight, shining medially, slightly indented at each extreme side; mandibles obscurely 5-dentate, the fourth tooth very low and sometimes obliterated; lateral ocelli subequally distant from eyes and edge of vertex; vertex slightly rounded; cheeks subequal to eyes in width; second to fourth segments of abdomen quite deeply grooved basally, the apical margins of the second to the fifth more or less deeply and abruptly depressed, more so laterally and on the more apical segments, the sixth somewhat concave laterally, rather narrowly rounded apically, quite distinctly concave in profile, with only a slight amount of erect pubescence visible toward the extreme base.

Puncturation: Close and rather fine on cheeks, face, pleura above, on scutellum, and on mesonotum laterally; somewhat more coarse on clypeus and supraclypeal area, sparse medially; rather coarse and distinct on vertex, pleura below and on mesonotum medially, more sparse on vertex laterally; minute and indistinct on abdomen basally, becoming deep and distinct and rather widely separated, though fine toward the fifth segment, minute and densely crowded on the sixth.

Color: Black; antennae and tegulae reddish-piceous; wings uniformly and rather deeply infuscated, not much darker apically, the nervures piceous; spurs yellow.

Pubescence: Short and mostly white on head, thorax, legs and first segment of abdomen, but the vertex and mesonotum with short inconspicuous dark pubescence; extremely short and hardly discernible on the second to fifth segments of abdomen, apparently largely blackish, the sixth

segment with very fine whitish tomentum apically and erect whitish hairs toward the base; first to fifth segments with entire white apical fasciae, but that on the first often indistinct; scopa entirely pale ochraceous.

Male.—Size: Length 9 to 11 mm.; breadth of abdomen 3 to 4 mm.; anterior wing 7 to 8.5 mm.

Structure: Face about as broad as long; eyes very slightly convergent below; clypeal margin nearly straight, with a few minute crenulations medially; inferior mandibular projection basal, the apex acute; lateral ocelli subequally distant from eyes and edge of vertex; vertex very slightly rounded; cheeks slightly broader than eyes; front coxae thinly pubescent anteriorly, with minute acute tubercles representing the spines; second to fourth segments of abdomen deeply grooved basally, the apical margins of the second to the fifth more or less depressed except on the second medially, these depressions abrupt and marked laterally; sixth tergum nearly ventral in position, slightly protuberant toward the base medially, the carina very low, with a small median emargination, sometimes slightly crenulate on each side, the median carinate teeth of the apical margin quite conspicuous, considerably nearer the acute spine-like lateral teeth than to each other; seventh tergum evident, the apical margin somewhat carinate and sometimes slightly emarginate medially, quite deeply excavated above the margin.

Sternites: Lateral portions of fifth presternite longer than broad, each with a few scattered apical setae, the median portion broadly constricted, almost linear, the medasternite extensive, its basal margin straight medially, rounded laterally, the surface densely covered with long setae, those along the basal margin recurved, the poststernal strip quite broad except at extreme sides; lateral portions of sixth presternite narrow, each with an apical patch of fine setae, the sternum much broadened medially, with extensive medasternal areas having numerous long robust recurved setae, the poststernite short and rather broad, slightly more produced medially where it is fringed with minute setae.

Genital armature: Stipites slender, each with a large and conspicuous dorsal protuberance basally, slightly constricted medially, the apical half evenly curved, somewhat dilated just above the median constriction, minutely setose on inner face, the tips rounded; sagittae rather broad, slightly constricted apically, the tips truncate, slightly exceeding the tips of the stipites; volsellae somewhat rounded in lateral aspect, triangularly acute in ventral aspect.

Puncturation: Rather fine and close over most of cheeks, pleura and scutellum; more distinct but rather close on vertex medially and mesonotum laterally, more coarse and sparse on vertex laterally and mesonotum medially; very fine and close on abdomen basally, becoming more coarse, deep and rather widely separated toward the fifth segment, but quite close toward the apical margin of the fifth, fine and densely crowded on the sixth.

Color: Black; antennae dark ferruginous beneath; tegulae yellowish-ferruginous; wings lightly infuscated, slightly darker apically, the nervures yellowish-ferruginous; spurs yellowish.

Pubescence: Mostly white on head, thorax, legs and on first and second segments of abdomen, but vertex and mesonotum with shorter black pubescence more or less intermixed with longer white hairs; blackish and extremely short and obscure on third to fifth segments, although the fifth with longer pale hairs in addition, the sixth with only thin erect pale pubescence; first to fifth segments with entire white apical fasciae, sometimes thin or inevident on the first, the third to fifth pale tomentose basally.

Type.—Male; Colorado. [A.N.S.P., no. 2440].

Range.—This species ranges from North Carolina to Nova Scotia, west to the Pacific Coast and into Mexico, and is in flight through the warm seasons. Detailed records are as follows:

California: 3♀, no locality record. 1♂, Auburn, July 25, 1915, (L. Bruner). 1♂, Los Angeles, March 24, 1933, (Hicks). 1♀, Yosemite Valley, June 24, 1926, (Timberlake). 2♀, Riverside, May 3 and July 6, 1928, (Timberlake; on *Senecio douglasii* and garden *Coreopsis*), [Timberlake]. Also identified from Alta Meadow (August), Placer County, and Poway (April).

Colorado: 4♂, 1♀, no locality record. 1♀, no data, (C. F. Baker). 1♂, Arboles, (C. F. Baker; on *Carduus*). 1♂, Boulder, Nov. 2, 1928, (Hicks). 1♀, Denver, July 20, 1897, (on *Mentzelia*). 4♂, Boulder, Sept. 26, 1913, (M. M. Ellis; on *Argemone*). 1♀, Boulder, Aug. 7-12, 1919. 2♂, 1♀, Boulder County, July 26, Sept. 12 & 16, 1925, (Hicks). 1♂, 3♀, Boulder County, July 27, and Sept. 17-18, 1925, (C. P. Custer). 3♂, Hubbard Ranch, Elbert, June 9, (Figgins; on *Gilia*). 1♀, Pingree Park, Aug. 15, 1932, (Helen James). Also identified from Bear Creek, Cascade, Colorado Springs, Duck Creek, Erie, Fleming, Fort Collins, Jim Creek, Pinos, Platte Canyon, Pleasant Valley, South Fork of Rio Grande, and Ute Creek.

Connecticut: 1♀, Hartford, Aug. 20, 1897, (on *Vernonia*). Also identified from Colebrook, (July).

Idaho: 2♀, Preston, July 17, 1922, (E. P. VanDuzee).

Illinois: 1♂, Palos, June 18, 1932, (H. Pearson).

Indiana: 1♂, no locality record.

Maine: 1♂, no locality record. 1♀, Saco, Sept. 7, 1926, (Mitchell; on thistle). Also identified from Glenmere.

Maryland: 1♂, near Plummer's Island, Aug. 14, 1916, (J. C. Crawford; on *Polymnia uvedalia*).

Massachusetts: 1♂, Needham, June 11, 1925, (Mitchell; on *Geranium maculatum*). Also identified from Rutland.

MEXICO: 4♂, Guadalajara, July 6, 16, 27, (McClendon).

MICHIGAN: 2♂, Baraga County barrens, July 20 & 22, 1903. 1♂, Shore of Keweenaw Bay, July 15, 1903. 1♂, 1♀, Pequaming, July 22, and Aug. 1, 1903. 1♂, Point Abbaye, July 28, 1903; (all Morgan Hebard).

MONTANA: 2♂, 3♀, no locality record. Identified from Missoula.

NEBRASKA: 1♀, Glen, Sioux County, Aug. 8, 1905. 2♂, Mitchell, June 11 & July 1, 1924, (on *Circium* and primrose). 1♀, War Bonnet Canyon, Sioux County, June 28, 1901, (M. A. Carriker, Jr.; on *Campanula*). Also identified from Crawford, Haigler, Harrison, Lincoln, Malcom, Monroe Canyon, and West Point.

NEW MEXICO: 1♂, Alamogordo, May 16, 1902. 1♂, Beulah, May 30, (W. P. Cockerell; on *Salix*). 1♀, Chilcorico Canyon, near Raton, Aug. 25, (Cockerell). 5♂, Highrolls, May 29, June 2 & 11, 1902. 1♂, Las Cruces Aug. 23, (Cockerell). 1♂, near Harrisons, Pecos, June 30, (W. P. Cockerell; on *Opuntia*). 1♂, Pecos, June 26, (W. P. Cockerell). 1♂, Rinconada, Sept. 26, (Cockerell, No. 5599; on *Verbesina encelioides*). Also identified from Little Tesuque Canyon, Vic. Santa Fe, 9200 ft., July-August.

NEW YORK: 1♂, no locality record.

NORTH CAROLINA: 1♀, Julian, Aug. 30, 1922, (Mitchell; on *Vernonia*). 1♂, Highlands, July 25, 1925, (Mitchell; on *Coreopsis stellata*).

ONTARIO: 1♀, Soo, July 25, 1932, (H. Pearson). Also identified from Haileybury, Ottawa, and Thornloe.

PENNSYLVANIA: 1♂, North Mt.

TEXAS: 1♀, no locality record. 1♂, 3♀, Austin, Apr. May, and Sept. 1♀, Bexar County, May 6, 1934, (Parks). 1♂, Fedor, Sept. 18, 1897, (Birkman). 1♂, Goldthwaite, Sept. 4, 1905, (J. C. Crawford; on *Eryngium* sp.). 1♀, San Antonio, (Lot 210; labelled *Megachile texana*). 1♀, Victoria, April 7, 1904, (J. C. Crawford; on *Opuntia*). 1♂, Ysleta, April 2, 1902. Also identified from Lee County.

UTAH: 1♀, Salt Lake, (Timberlake; on thistle), June 29, 1913, [Timberlake]. Also identified from Ogden (August).

WASHINGTON: 1♂, Longmire, Ranier Nat. Park, July 27, 1920, (E. C. VanDyke). 1♂, Olympia, June 20, 1896. Also identified from Bridge Basin, Pullman (July), Wawawai, and Yakima City.

Specimens have also been identified from the following localities: Alberta — Calgary and Tofield (August); Arizona; British Columbia — Agassiz, Lytton, Peachland, Sidney, and Vernon; Kansas-Baldwin and Medora (June); Missouri; New Hampshire—Durham and Peterboro; New Jersey—Ramsey (June); North Dakota—(July-August), Fargo and Union; Nova Scotia; Oregon—(June-July), Crane and Corvallis; Quebec-Levis; Saskatchewan — Medicine Hat; Vermont — Rutland (August); Virginia — Falls Church (June) and Glen Carlyn; Wyoming—Jackson Hole, 6600 ft.

Flower records.—*Medicago, Verbena, Helianthus, Lactuca, Rosa, Gutierrezia, Campanula, Opuntia, Vernonia, Argemone intermedia, Circium lanceolatum, Centaurea jacea* (cult.), *Carduus undulatus, Coreopsis stellata,* and *Geranium maculatum.*

Megachile (Anthemois) inermis Provancher (Pls. VIII and IX)

Megachile simplex Provancher, (nec. Smith), Nat. Canad., XIII, p. 229, 1882. Provancher, (nec. Smith), Pet. Fauna Ent. Canad., p. 712, 1883. Provancher, (nec. Smith), Add. & Cor. Faun. Hym., p. 323, 1888.

Megachile inermis Provancher, Add. & Cor. Faun. Hym., p. 462, 1888. Cockerell, Entomologist, XXXII, p. 14, 1899. Friese, Das Tierr. Lfg. 28, Apidae I, p. 239, 1911. Sladen, Can. Ent., LI, p. 125, 1919.

Megachile simplicissima Dalla Torre, Cat. Hym., X, p. 449, 1896.

Megachile sapellonis Cockerell, Ann. Mag. Nat. Hist., (7), VI, p. 7, 1900.

Megachile temporalis (male only) Friese, Zeit. Hym. Dipt., III, p. 248, 1903.

Cyphopyga inermis Titus, Proc. Ent. Soc. Wash., VII, p. 151, 1905.

Megachile decipiens Lovell & Cockerell, Psyche, XIV, p. 19, 1907. Cockerell, Ann. Mag. Nat. Hist., (8), XI, p. 532, 1913. Cockerell, Occas. Pap. Mus. Zool. Univ. Mich., XXIII, p. 5, 1916.

This species is a close affinity of *M. ligniseca* Kirby of the Palaearctic region. The two seem to be fairly distinct, however, since the clypeal margin in the latter is more nearly entire in the female, and the scopa is more or less blackened apically.

Female.—Size: Length 15 to 20 mm.; breadth of abdomen 5 to 5.5 mm.; anterior wing 11 to 12 mm.

Structure: Face as long as broad; eyes parallel; clypeal margin with a rather deep emargination on each side of middle, the area between these very slightly incurved and with a minute median denticle; mandibles distinctly 5-dentate; lateral ocelli nearer to each other than to eyes, and considerably nearer eyes than to edge of vertex; vertex nearly flat; cheeks much broader than eyes; second to fourth abdominal segments quite distinctly but not deeply grooved basally, apical margins of the second to the fifth rather deeply depressed laterally, only slightly so medially, and then only on the more apical segments, the sixth tergum rather broadly rounded or subtruncate apically, straight in profile, with suberect hairs visible toward the base.

Puncturation: Close and rather fine on face, cheeks below, on scutellum, and on pleura above and mesonotum laterally; moderately coarse and rather close over most of mesonotum and on vertex medially; quite sparse over most of clypeus and on supraclypeal area, on vertex laterally, and to a less degree in center of mesonotum; very fine on abdomen,

rather close basally, sparse on the shining apical segments, but minute and densely crowded on the sixth tergum.

Color: Black; antennae and tegulae piceous; wings lightly and quite uniformly infuscated, only very slightly darker apically, the nervures piceous; spurs yellowish-ferruginous.

Pubescence: Pale ochraceous or whitish on face and clypeus, cheeks below, pleura, propodeum, legs, and on first abdominal segment; black or fuscous on vertex, cheeks above and behind eyes, over most of mesonotum and scutellum, and with shorter sparse black pubescence on discs of second to sixth abdominal segments, the second to the fifth with white apical fasciae which are usually entire on the more apical segments, often interrupted on the more basal ones; scopa entirely pale ochraceous.

Male.—Size: Length 11 to 15 mm.; breadth of abdomen 3.5 to 4.5 mm.; anterior wing 8 to 11 mm.

Structure: Face as long as broad; eyes parallel; clypeal margin with several small tubercles or denticles medially, somewhat incurved on each side; inferior mandibular projection slender, basal, acute, the apex slightly recurved; lateral ocelli slightly nearer to each other than to the eyes, and slightly nearer eyes than to edge of vertex; vertex nearly flat; cheeks much broader than eyes; front coxae thinly pubescent anteriorly, with dentiform tubercles representing the spines; second and third abdominal segments quite deeply grooved basally, the fourth somewhat less so, apical margins of the second to the fifth more or less deeply depressed, more so laterally and on the more apical segments; sixth tergum vertical in position, with a slight median ridge toward the base, the carina low, with a rather broad and definite though shallow median emargination, usually entire otherwise, apical margin of the segment with extremely low carinate median teeth which are widely spaced and located close to the small but definite spine-like lateral teeth; seventh tergum robust, broadly triangular, but with the tip slightly emarginate, somewhat excavated above the carinate margin.

Sternites: Lateral portions of fifth presternite longer than broad, each with an apical patch of fine setae, the median portion linear, the medasternite extensive, slightly oblique laterally, the surface well covered with moderately robust setae, the poststernite not differentiated from the apical margin of the medasternite except at extreme sides; lateral portions of sixth presternite subtriangular, each with an extensive apical area of minute setae, the sternum only slightly broadened medially, with quite definite triangular medasternal areas having numerous robust spine-like setae, the poststernite very short and broad, fringed medially with minute setae.

Genital armature: Stipites robust, each with a small dorsal carinate projection basally, much constricted medially, the apical half much dilated, with numerous long robust setae on inner face, the tip constricted and somewhat twisted; sagittae broad throughout, the tips compressed, with a few short minute setae, much exceeding the tips of the stipites; volsellae rounded in lateral aspect, triangular and acute in the ventral aspect.

Puncturation: Fine and close on cheeks, face, scutellum and over most of mesonotum; rather coarse and distinctly separated in center of mesonotum; shallow and rather close on pleura; deep and distinct on the vertex, close medially, sparse laterally; minute and indistinct on the shining abdomen, close on the first segment, but sparse on the others to the fifth, close and shallow on the sixth which sometimes has scattered minute and indistinct denticles in addition.

Color: Black; antennae and tegulae piceous; wings lightly infuscated, slightly darker apically, the nervures ferruginous or piceous; apical tarsal joints more or less ferruginous; spurs yellow.

Pubescence: Long and fuscous on vertex, on cheeks above and behind eyes, and in center of mesonotum, with a few dark hairs on the front and middle tibiae; otherwise pale ochraceous on head, thorax, legs and the first and second abdominal segments, more whitish beneath and on abdomen; black on discs of third to fifth segments, the sixth with fine thin subappressed pubescence and erect usually pale hairs, the second to fifth segments with white apical fasciae, entire on the more apical segments, interrupted on the basal ones, the fourth and fifth with white tomentum basally.

Type.—Male; Canada. [Mus. Dept. Publ. Instruc. Quebec, no. 873].

Range.—North Carolina to Nova Scotia, west to Texas, New Mexico, Utah, Idaho, and British Columbia. Detailed records are as follows:

Colorado: 6♂, 2♀, no locality record. 1♂, 1♀, Ute Creek, 9000 ft., July 3 & 31, (L. Bruner). Also identified from Aspen, Colorado Springs, Creede (August), Fort Garland, Gothic, July 14, 1929, (E. C. Nelson), Pikes Peak (July), Silverton, and Ward.

Georgia: 1♂, 2♀, no locality record.

Kansas: 2♂, 1♀, no locality record.

Maine: 1♀, Waldoboro, July 1898, (on Thistle).

Michigan: 1♂, Baraga County barrens, July 20, 1903. 3♂, Pequaming, July 2 & 15, Aug. 5, 1903. 1♂, 1♀, Pequaming Point, Aug. 4 & 12, 1903. 2♂, Point Abbaye (foot of), July 24, 1903, (in woods); (all Morgan Hebard).

Minnesota: 1♀, Beaver River, Lake County, Aug. 11 & 12, 1912, (Witmer Stone). 1♂, Cook County, July 28, 1928, (Blanche Orr). 3♀, Duluth, St. Louis County, Aug. 6-8, 1912, (Witmer Stone). 1♂, 1♀, Lake Itasca, June 28, 1921. Also identified from Frazee, Moorhead, and Wahkon (June-August).

New Hampshire: 1♂, Lancaster, July 21, 1908. 2♀, Lancaster, Aug. 27, 1928, (on *Inula helenium*), (all Timberlake), [all Timberlake]. Also identified from Littleton.

NEW MEXICO: 1♂, Beulah, (W. Porter). 1♀, Beulah, Aug 17, (H. Skinner). 1♀, Beulah, July 30, (Cockerell). 3♂, 1♀, Cloudcroft, May 27, June 18 & 19, 1902. Also identified from Beatty's Cabin (August).

NEW YORK: 2♀, Beaverkill, Aug. 10, 1909, (E. T. Cresson, Jr.). Also identified from Binghamton, Ithaca, and McLean, (July and Sept.).

NORTH CAROLINA: 2♂, Cruso, June 28, 1934, (Mitchell; on *Pentstemon*).

PENNSYLVANIA: 1♀, Nebraska, Aug. 28, 1932, (J. Pearson).

UTAH: 1♀, no locality record.

WYOMING: 1♂, 1♀, Laramie River. Also identified from Jackson (July).

Specimens of *inermis* have also been identified from the following localities: Alberta—(June-September), Bilby, Calgary, Cooking, Edmonton, Lake Nipigon, Lethbridge, Slave Lake and Topfield; British Columbia; Idaho—Collins (July); Lake Superior—Isle Royal; Manitoba—Dauphin and Teulon; Massachusetts—Minot County; Montana—Beaver Creek (August); New Brunswick; North Dakota—Fargo (June and July) and Turtle Mts.; Ontario—Bobcaygeon, Ottawa, Sudbury and Toronto; Quebec—Fort Coulange; South Dakota—Custer, Hot Springs (Sept. 1, 1930, Rodeck); Texas; Vermont—Woodstock; Wisconsin—Fish Creek (August).

The form described by Cockerell under the name *sapellonis* is western in distribution and is more conspicuously fasciate and averages somewhat larger than the eastern form, with the pubescence of the second segment of the abdomen often entirely white. No other differences are noticeable, and as all possible intergradations between the forms can be found in any considerable series of specimens, they are not considered to be distinct.

Flower records.—Carduus undulatus, Sanicula marylandica, Rubus strigosus, R. villosus, Lathyrus venosus, Nepeta cararia, Taraxacum officionale, Baptisia tinctoria, Pentstemon sp., *Polymnia uvedalia, Tephrosia virginiana, Vernonia* sp., and *Inula helenium.*

Megachile (Anthemois) nivalis Friese

Megachile nivalis (female only) Friese, Zeit. Hym. Dipt., III, p. 246, 1903.
Megachile (*Anthemois*) *santiamensis* Mitchell, Trans. Am. Ent. Soc., LIX, p. 311, 1934.

This species was described in Part I of this Revision under the name *santiamensis,* its similarity to *nivalis* being indicated and the apparent differences of the two explained. Since the publication of that description a specimen which was sent to Dr.

Hedicke in Berlin for comparison with the type of *nivalis* has been returned with the information that the two are without doubt the same, the apparent differences being due to inaccuracies in the original description.

Type.—Female; Pikes Peak, Colorado. July, 9000. (Fruhstorfer). [Zool. Mus. Berlin Univ.].

The male described with *nivalis* female proves to be that of *M.* (*Sayapis*) *fidelis* Cresson, with which it has been compared by Dr. Hedicke. Thus the true male of the species is yet to be discovered. It seems barely possible that *M.* (*Delomegachile*) *giliae* Cockerell is the male, since the two occupy much the same range, and no female has so far been discovered for *giliae*. If this proves to be a fact, the species must be considered a somewhat anomalous member of the Subgenus *Delomegachile*, since the male is without doubt a member of that group, but the female shows more similarities to *centuncularis* and *relativa* than to any of the species of *Delomegachile*. If these two are shown to be the same, the close affinity of the two subgenera will become evident, and it may be desirable to lump the two.

In the list of paratypes of *santiamensis* (p. 312) the locality White Horse, Yukon Territory is erroneously given as "White House", and the specimen should be credited to W. P. Cockerell.

A recent record of this species is as follows: 1 ♀, Breitenbush, Hot Springs, Oregon, 2222 ft., July 6, 1934, (H. A. Scullen).

Subgenus **DELOMEGACHILE** Viereck

Delomegachile Viereck, Conn. Nat. Hist. Surv. Bull., XXII, p. 745, 1916. Mitchell, Trans. Am. Ent. Soc., LIX, p. 300, 1934.

Tongue.—First and second joints of labial palpi subequal, or the second very slightly longer than the first; maxillary palpi minutely pubescent, the third joint somewhat longer and more slender than the others.

Female.—Mandible 4-dentate, the inner tooth either rounded or truncate, a more or less obscure cutting edge between the third and fourth teeth, and with at most but a trace of one between the second and third; basal joint of flagellum somewhat longer than the second joint, the latter subequal to the pedicel; metatarsi considerably shorter and usually narrower than their tibiae; claws without distinct basal teeth, although sometimes with

robust tooth-like basal setae; sixth tergum subtruncate or rounded apically, usually straight in profile, with abundant erect hair visible; sixth sternum without a definite bare area and entirely lacking a bare apical lip.

Male.—Mandible 4-dentate, with a robust basal inferior projection; basal joint of flagellum usually somewhat longer than the pedicel; cheek more or less excavated at inferior angle, the lower margin of the excavation protuberant; front coxae definitely spined, and usually with a patch of red bristles anterior to each spine; front tarsi usually dilated and otherwise modified; mid tibia with the usual apical spur; sixth tergum vertical in position, with a conspicuous carina which is usually definitely emarginate medially, the apical margin of the tergum usually with distinct median and lateral teeth; seventh tergum quite robust, usually protuberant or acute medially.

Male sternites.—Fourth sternum exposed; fifth presternite usually extensive, distinctly demarked from the medasternite by a membraneous area, the poststernal strip usually definite; lateral portions of sixth presternite usually longer than broad, the medasternal areas more or less distinct, and usually with a broad and short poststernal lobe.

Genital armature.—Stipites robust, the tips more or less protuberant but not conspicuously lobate, the sagittae more slender but of about equal length.

GENOTYPE: *Megachile vidua* Smith [Haplotype.]

This group is Holarctic in distribution, *M. willughbiella* and *M. nigriventris* being representative Palaearctic species. As originally described it included only *M. vidua* Smith, which is therefore the genotype.

But one reference to the nesting habits of species of Nearctic *Delomegachile* has been noted in the literature, Hicks [8] having observed *wootoni* nesting in the ground. The cells of this nest were constructed of leaves which he was unable to identify. According to Smith [9] the nests of *willughbiella* of the Palaearctic region have been found in burrows in willow trees. One unpublished record of the site chosen by *vidua* is available, a specimen collected by Timberlake at Murray, Utah bearing the following note: "nesting in rotten log".

These three scattered records indicate considerable diversity in nesting sites chosen by this group of species, but it remains to be seen whether or not this diversity occurs within the individual species.

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[8] Univ. Colo. Stud., (15), III, pp. 321-322, (1926).

[9] Proc. Ent. Soc. London, 1867, p. cvi.

Key to Species of Delomegachile

Females

1. Inner mandibular tooth rounded or acute.....2
   Inner mandibular tooth broadly truncate.....8
2. Second to fifth abdominal terga black pubescent on discs, and with contrasting entire white apical fasciae.....*addenda* Cresson
   Apical half of abdomen either entirely black pubescent or entirely pale pubescent, not conspicuously fasciate.....3
3. Scopa entirely deep black.....4
   Scopa usually red or orange, pubescence of second tergum entirely pale.....5
4. Pubescence of second abdominal tergum black along apical margin; pleura pale pubescent above.....*mucida* Cresson
   Second tergum entirely pale pubescent; pleura entirely black pubescent. *melanophaea* var. *submelanophaea* n. var.
5. Pleura black pubescent below....*melanophaea* var. *calogaster* Cockerell
   Pleura entirely pale pubescent.....6
6. Vertex and mesonotum with considerable black pubescence; sixth tergum black pubescent.....*melanophaea* Smith
   Vertex and mesonotum with little or no black pubescence; sixth tergum usually pale pubescent.....7
7. Fourth and fifth abdominal terga with conspicuous black pubescence; legs entirely black pubescent....*melanophaea* var. *wootoni* Cockerell
   Fourth and fifth terga with only very inconspicuous black pubescence at most; legs pale pubescent....*melanophaea* var. *rohweri* Cockerell
8. Pubescence entirely deep black.....*gemula* var. *cressonii* Dalla Torre
   Pubescence pale in part.....9
9. Apical abdominal terga definitely white fasciate.....10
   Apical abdominal terga not fasciate.....11
10. Scopa entirely black on the sixth sternum, and black in part on the fifth.....*ingenua* Cresson
    Scopa not at all black apically.....*vidua* Smith
11. Scopa entirely black.....*gemula* Cresson
    Scopa entirely orange.....12
12. Mesonotum with only a few inconspicuous black hairs laterally; pubescence of legs largely blackish.....*gemula* var. *fulvogemula* n. var.
    Mesonotum with a conspicuous patch of black pubescence; pubescence of legs largely pale.....*vidua* var. *appalachensis* n. var.

Males

1. Front tarsi simple, neither dilated nor flattened.....*addenda* Cresson
   Front tarsi dilated and flattened to at least some slight degree, usually yellowish or reddish.....2

2. Front metatarsi mostly blackish.....*gemula* Cresson
   Front metatarsi definitely yellowish.....3
3. Median apical teeth on the apical margin of the sixth tergum produced into conspicuous slender spines.....4
   Median teeth of sixth tergum not spine-like.....5
4. Apical abdominal terga conspicuously black pubescent. *melanophaea* Smith
   Abdomen with little or no black pubescence. *melanophaea* var. *rohweri* Cockerell
5. Front metatarsi definitely narrower than their tibiae...*ingenua* Cresson
   Front metatarsi at least equal to their tibiae in width.....6
6. Front metatarsi much wider than their tibiae, almost as wide as long..7
   Front metatarsi subequal in width to their tibiae, much longer than wide.....8
7. Abdomen with only traces of white apical fasciae, and then usually only on the fifth tergum.....*vidua* var. *appalachensis* n. var.
   Apical fasciae more conspicuous on the second, third and fourth terga. *vidua* Smith
8. Front metatarsal scale protruding over and almost to the tip of the second joint.....*mucida* Cresson
   Front metatarsi not protruding over the second joint....*giliae* Cockerell

Megachile (Delomegachile) addenda Cresson (Pls. VIII and IX)

Megachile addenda Cresson, Trans. Am. Ent. Soc., VII, p. 124, 1878. Robertson, Trans. Am. Ent. Soc., XXIX, p. 172, 1903. Friese, Das Tierr. Lfg. 28, Apidae I, p. 233, 1911. Cockerell, Ann. Mag. Nat. Hist., (8), II, p. 536, 1913. Cresson, Mem. Am. Ent. Soc., I, p. 110, 1916. Mitchell, Psyche, XXXIV, p. 178, 1927.
Megachile latimanus Provancher, Add. Fauna Can. Ent. Hym., p. 324, 1888.
Megachile manumuskin Viereck, Can. Ent., XXXIV, p. 328, 1902.
Anthemois addenda Titus, Proc. Ent. Soc. Wash., VII, p. 152, 1905.

Female.—Size: Length 11 to 14 mm.; breadth of abdomen 4 to 4.5 mm.; anterior wing 8 to 9.5 mm.

Structure: Face slightly broader than long; eyes subparallel; clypeal margin straight, finely denticulate or serrate; mandible 4-dentate, the inner tooth narrowly rounded, a cutting edge between the third and fourth, that between the second and third nearly obliterated; lateral ocelli subequally distant from eyes and edge of vertex; vertex slightly rounded; cheeks slightly broader than eyes; second to fifth abdominal terga deeply grooved basally and deeply depressed apically, appearing therefore as though "rolled" in middle of each disc; sixth tergum slightly concave in profile.

Puncturation: Fine and close on cheeks below, pleura, and on mesonotum and scutellum laterally; deeper and more coarse on clypeus, close laterally, more sparse medially; relatively coarse and sparse on vertex, and on

mesonotum and scutellum medially; very fine and quite close over most of abdomen, exceedingly close on the sixth tergum.

Color: Black; antennae and tegulae largely black; wings faintly infuscated or subhyaline basally, more distinctly infuscated apically, the nervures piceous or black; spurs dark ferruginous or piceous.

Pubescence: Black on vertex, mesonotum and scutellum, otherwise white on head, thorax, and on legs in large part; black on discs of second to fifth terga, but largely white on the first, with a small amount of dark, the first to the fifth with entire white apical fasciae, that on the first very thin, dense on the others; scopa white, black on the sixth sternum.

Male.—Size: Length 10 to 13 mm.; breadth of abdomen 3.5 to 4 mm.; anterior wing 8 to 9 mm.

Structure: Face slightly broader than long; eyes subparallel; clypeal margin straight, with a few shallow median crenulations; mandible 4-dentate, outer margin straight to near the tip in dorsal aspect, the inferior projection basal, narrow, subacute, the inferior margin deeply incurved between the apical tooth and the apex of the inferior projection; basal joint of flagellum very slightly longer than pedicel and very slightly shorter than the second joint, the apical one simple; lateral ocelli slightly nearer eyes than to edge of vertex; vertex slightly rounded; cheeks broader than eyes, the lower margin of the slight inferior concavity not appreciably produced; front coxae bare anteriorly, each with a rather large dense patch of short ferruginous bristles in front of the rather short flattened spine which is slightly narrowed to the rounded tip; front femur slightly keeled beneath apically; front tarsi slender and simple, neither dilated nor flattened; hind metatarsi narrowed apically, much longer than broad; second to fourth abdominal terga quite deeply grooved basally, and more or less deeply depressed across apical margins, deeply so laterally and on the more apical segments, obscurely so on the second; carina of sixth tergum with a broad and deep median emargination, the conspicuous lateral portions more or less dentate or crenulate, apical margin of the segment with small acute lateral teeth, the median ones lacking; seventh tergum conspicuous, produced medially into a triangularly pointed projection.

Sternites: Emargination of fifth presternite broad and deep, lateral portions longer than broad, median portion almost linear, medasternite extensive, twice as long as broad, apical margin straight, covered with fine and rather sparse setae, the poststernal strip broadly incurved; lateral portions of sixth presternite rather long and narrow, each with a slight apical groove, the medasternal areas indefinite, widely separated, with sparse fine setae, the poststernal lobe broad and short, the latero-apical angles acute.

Genital armature: Stipites narrowed above base, dilated and somewhat flattened toward apex, the tip slightly recurved, directed more or less laterally, subacute, with a small amount of fine pubescence, with some

extremely short minute pubescence on inner surface of apical half, the sagittae rather robust, slightly dilated apically, tips exceeding the stipites; volsellae slightly emarginate.

Puncturation: Fine and close on cheeks below and on pleura; somewhat more coarse and distinct, though quite close, on vertex medially and on mesonotum and scutellum; more coarse and sparse on vertex laterally; fine and close on abdomen basally, becoming more distinct and sparse on the more apical shining segments, very fine, close and quite deep, with some additional fine rugosities, on the sixth tergum.

Color: Black; antennae and tegulae piceous or black; wings very lightly and quite uniformly infuscated, the nervures ferruginous to piceous; legs entirely black, the spurs ferruginous.

Pubescence: Mostly whitish or pale ochraceous on head, thorax, legs and basal segment of abdomen, but vertex and mesonotum with considerable fuscous pubescence, and a slight intermixture of dark hair on scutellum; second to fifth abdominal terga black pubescent and with entire white apical fasciae, the sixth with scattered erect pale hairs; all the metatarsi more or less definitely fringed with white pubescence, the front tarsal fringe more dense than the others.

Type.—Female; Georgia. [A.N.S.P., no. 2418].

Range.—New England and Southern Canada southward to Florida, west through Michigan, Kansas, and Texas, to California, May to July (April in Texas). Definite records include the following:

GEORGIA: 1♂, Tifton, May 19, 1896.

ILLINOIS: 2♂, no locality record.

KANSAS: 1♀, no locality record. 2♀, Topeka, June. Identified also from Baldwin, Blue Rapids, and Medora (June).

MASSACHUSETTS: 1♀, no locality record. 1♂, Needham, June 24, 1921, (Mitchell). 1♀, Needham, July 17, 1926, (Mitchell; on *Baptisia*). Also identified at Manomet, Hyannis, and Tisbury.

MISSOURI: 2♂, Columbia, June 7, 1923, (Bromley).

NEW YORK: 1♀, Nyack, 1883, (J. L. Zabriskie). Identified also from Lakehurst, (June).

NORTH CAROLINA: 1♀, Carolina Beach, May 19, 1934. 1♀, Fayetteville, May 20, 1934, (on *Tephosia*). 2♀, Kenansville, May 18, 1934, (on *Tephrosia*). 2♀, Merry Oaks, May 27, 1926, (on *Tephrosia*). 1♂, 7♀, Raleigh, May 20-June 5, (on *Tephrosia, Pentstemon,* and *Oenothera*). 2♂, Shining Rock Mt., 6000 ft., June 24, 1934. 1♀, Southport, June 24, 1928, (on *Hypericum*). 3♀, White Lake, May 20, 1934, (on *Opuntia*). 1♂, Wilmington, May 20, 1934; (all Mitchell).

PENNSYLVANIA: 1♂, 1♀, Lehigh Gap, June 26, 1901. Identified also from Craighead, North Cumberland, and Rockville, (July).

TEXAS: 1♀, no locality record. Identified from Fedor, (April).

Specimens have been identified also from the following localities: Florida—Paradize Key; Michigan—Grand Rapids (June); New Hampshire—Hanover (July); New Jersey; Oklahoma—Ardmore; Ontario—Toronto; and Virginia—Great Falls.

Flower records.—*Amorpha canescens, Baptisia tinctoria, Hypericum* sp., *Oenothera* sp., *Opuntia vulgaris, Pentstemon* sp., *Psoralea floribunda, Tephrosia virginiana,* and *Vaccinium* sp.

Megachile (Delomegachile) gemula Cresson (Pls. VIII and IX)

Megachile gemula (male only) Cresson, Trans. Am. Ent. Soc., VII, p. 118, 1878. Friese, Das Tierr., Lfg. 28, Apidae I, p. 238, 1911. Cresson, Mem. Am. Ent. Soc., I, p. 119, 1916. Mitchell, Psyche, XXXIV, p. 178, 1927. Mitchell, Trans. Am. Ent. Soc., LIV, p. 333, 1929.

Megachile mucida (female only) Cresson, Trans. Am. Ent. Soc., VII, p. 118, 1878. Friese, Das Tierr., Lfg. 28, Apidae I, p. 242, 1911.

Megachile avara Cresson, Trans. Am. Ent. Soc., VII, p. 123, 1878. Friese, Das Tierr., Lfg. 28, Apidae I, p. 234, 1911. Cresson, Mem. Am. Ent. Soc., I, p. 112, 1916.

Megachile vancouverensis Provancher, Add. Fauna Hym., p. 425, 1888. Titus, Proc. Ent. Soc. Wash., VII, p. 151, 1905. Friese, Das Tierr., Lfg. 28, Apidae I, p. 247, 1911. Cockerell, Ann. Mag. Nat. Hist., (8), XI, p. 531, 1913.

Megachile albula Lovell and Cockerell, Psyche, XIV, p. 18, 1907.

Megachile gemula albula Cockerell, Ann. Mag. Nat. Hist., (8), XI, p. 531, 1913.

There has been some confusion between this and two other species, *M. mucida* and *M. vidua,* due to errors in correlations of the sexes. The male of *gemula* has been made the type, and the female originally described under the name *mucida* is the true female of *gemula.* The female described under the name *gemula* is a variety of *M. vidua.*[10]

Female.—Size: Length 12 to 15 mm.; breadth of abdomen 4 to 5 mm.; anterior wing 8.5 to 10 mm.

Structure: Face somewhat broader than long; eyes subparallel; clypeal margin with a median shining area which is very shallowly emarginate, otherwise entire; mandible 4-dentate, the inner tooth broadly truncate, a short incomplete cutting edge between the second and third teeth, a complete one between the third and fourth; lateral ocelli subequally

[10] Psyche, XXXIV, p. 178, (1927).

distant from eyes and edge of vertex; vertex nearly flat; cheeks broader than eyes; second to fourth abdominal terga slightly grooved basally, the apical margins of the second to the fifth distinctly depressed laterally, but only obscurely so medially; sixth tergum straight in profile.

Puncturation: Fine and close on cheeks, mesonotum laterally, and on pleura; more coarse and distinct but rather close on vertex medially and on scutellum; quite sparse on vertex laterally and mesonotum medially; close and fine on clypeus laterally, becoming more coarse and sparse medially; minute on abdomen, more close basally, more sparse toward the fifth tergum, but very fine and close on the sixth.

Color: Black; antennae and tegulae more piceous; wings lightly infuscated, somewhat more deeply so apically, the nervures ferruginous to fuscous; spurs piceous.

Pubescence: Pale ochraceous over most of thorax and on the first abdominal segment, as also on the front femora posteriorly, with the face and clypeus pale pubescent at least in part; black on vertex cheeks at least in part, over most of legs, and on third to sixth abdominal terga, the second being black pubescent over apical half of disc, pale pubescent over the basal half; no abdominal fasciae evident; scopa entirely black.

Male.—Size: Length 8 to 11 mm.; breadth of abdomen 3 to 4 mm.; anterior wing 7 to 8 mm.

Structure: Face about as broad as long; eyes subparallel; clypeal margin with a median emargination bounded on each side by a triangular tubercle; mandible 4-dentate, outer margin rounded in dorsal view, inferior projection basal, the rather slender acute apex somewhat prolonged, inferior margin of mandible slightly angulate medially; basal joint of flagellum longer than pedicel, subequal to the second joint, the apical one not appreciably dilated and only slightly flattened; lateral ocelli subequally distant from eyes and edge of vertex; vertex nearly flat; cheeks slightly broader than eyes, lower margin of the inferior concavity with a flattened carinate protuberance; front coxae bare anteriorly, with a small patch of short ferruginous bristles in front of each short, flattened, apically rounded spine; front femora slightly keeled beneath apically; front tarsi slightly dilated and flattened, the metatarsus about as wide as the tibia, deeply excavated anteriorly, slightly produced apically, about as long as the second to fourth joints combined; mid metatarsi about twice as long as broad; hind metatarsi fully three times as long as broad; second and third abdominal terga somewhat grooved basally, the apical margins of the second to the fifth quite deeply depressed except on the second medially; carina of sixth tergum with a rather broad and shallow median emargination, slightly and irregularly crenulate on each side, apical margin of the segment with acute median teeth which are somewhat nearer the inconspicuous lateral teeth than to each other; seventh tergum barely evident, with a slight median triangular protuberance.

Sternites: Emargination of fifth presternite small, triangular, the lateral portions extensive, broader than long, medasternite very small, much

broader than long, densely covered with microscopic, scale-like setae, poststernal strip incurved medially; lateral portions of sixth presternite rather broad, slightly produced and rounded apically, medasternal areas definite, more extensive at inner end, linear toward outer end, with rather long flexed setae, poststernal lobe broad and short, with acute latero-apical angles.

Genital armature: Stipites constricted above base, flattened and dilated apically, the apex with a narrow, finger-like, lateral protuberance which is very minutely pubescent at tip, sagittae slightly bowed, the tips much exceeding the stipites, volsellae triangular, more or less acute at tip.

Puncturation: Very fine and close on cheeks below, on pleura, and on mesonotum and scutellum laterally; more coarse but rather close on cheeks above, and on vertex and scutellum medially; quite sparse on vertex laterally and mesonotum medially; very minute and indistinct on abdomen, more close basally, becoming rather sparse to the fifth tergum, shallow and close on the sixth.

Color: Black; antennae and tegulae more piceous; wings faintly infuscated basally, slightly more so apically, the nervures ferruginous; front femur black on posterior face, mostly ferruginous on anterior face, but black along upper margin, the upper face mostly black, with a central ferruginous area; front tibiae black on outer face, more or less dark ferruginous on the other two faces; front tarsi dark basally, becoming more whitish on the apical joints; mid and hind legs black, the spurs piceous.

Pubescence: Mostly white on head, thorax, legs, and on first and second abdominal segments, but vertex with some inconspicuous blackish pubescence, the tibiae with short black hairs, and mid metatarsi with dense brownish-fuscous pubescence on outer face; largely black on fourth and fifth abdominal terga, the third with black pubescence apically, white basally, the sixth with largely pale pubescence; third and fourth terga with evidences of white apical fasciae toward the sides, but these often entirely lacking, the fifth usually not fasciate to any degree; front tarsal fringe entirely white, the metatarsal scale fringed anteriorly with short brownish-fuscous pubescence.

Type.—Male; Georgia. [A.N.S.P., no. 2425].

Range.—Throughout Canada and northern United States, south through the highlands of California, Arizona, New Mexico, and the Southern Appalachians, May to August. Definite records include the following:

British Columbia: 1♂, Invermere, June 30, 1914, (F. W. L. Sladen). 1♂, Kaslo. 1♂, Shawnigan, July 24, 1904. Also identified from Golden, Okanagan, Spillemachine, Summerland, and Vernon.

California: 1♂, Yosemite Valley, June 4, 1926, (Timberlake; on *Asclepias speciosa*).

COLORADO: 1♂, no locality record. 1♂, 2♀, Boulder County, July 25 and 27, 1925, (C. P. Custer).

CONNECTICUT: 1♂, 1♀, Hartford, May 3, 1896 and July 3, 1893. 1♂, Union, June 24, 1921. Also identified from Colebrook, (Aug.).

MACKENZIE: 1♂, Fort Wrigley, Mackenzie River, July 17, 1922, (C. H. Crickmay). Also identified from Fort Norman.

MAINE: 1♂, 1♀, Saco, June 7, 1921, (Mitchell; on *Rubus*).

MASSACHUSETTS: 1♂, Brookline, June 7. 5♂, Forest Hills, June 28 to Aug. 3, (on *Baptisia, Vicia, Philadelphus,* and *Apocynum*). 5♂, Needham, June 1, 20, and 24, 1921, (on *Geranium* and *Trifolium*). 7♂, 1♀, Needham, June 11-22, 1925, (on *Apocynum* and *Geranium maculatum*). 1♀, Needham, Aug. 7, 1926, (on *Baptisia*); (all Mitchell). 1♂, 1♀, Southampton, July 10 & 11, 1894. Also identified from Medford.

MICHIGAN: 1♂, no locality record. 1♂, Point Abbaye, July 10, 1903, (Morgan Hebard). 1♀, Roseland, July 24, 1932. 4♂, Saugatuck, May 29 & 30, 1932; (both H. Pearson). Also identified from Alpena.

MINNESOTA: 1♀, Duluth, St. Louis County, Aug. 6-8, 1912, (Witmer Stone).

NEW HAMPSHIRE: 4♀, Lancaster, Aug. 20 and 27, 1928, (Timberlake; on *Apocynum androseamifolium* and *Solidago lanceolata*).

NEW JERSEY: 1♀, Glouchester County, Aug. 31, 1890 (W. J. Fox; labelled *M. mendica*). 1♀, Ocean Grove, July 14, 1893.

NEW MEXICO: 4♂, Cloudcroft, June 16, 18, and 19, 1902.

NORTH CAROLINA: 2♀, Highlands, July 24, 1922, (on *Baptisia*). 1♂, 1♀, Horse Cove, Highlands, July 25, 1925, (on *Hydrangea*). 1♀, Mt. Pisgah, 5000 ft., June 23, 1934. 6♀, Shining Rock Mt., 6000 ft., June 24, 1934, (on *Rhododendron*). 3♀, Smokemont, June 30, 1934, (on *Chrysanthemum leucanthemum*); (all Mitchell).

ONTARIO: 1♀, Point au Baril, July 20, 1930, (L. Giovannoli). 3♂, Point Pelee, June 16, 1920, (N. K. Bigelow). Also identified from Lake Nipegon and Ottawa.

OREGON: 1♂, Wild Horse Canyon, Steen Mts., 4270-6000 ft., July 5, 1927, (H. A. Scullen).

PENNSYLVANIA: 7♂, 16♀, Lehigh Gap, June 25-30, 1901. 1♀, Pocono, June 19, 1906, (P. P. Calvert).

WASHINGTON: 2♂, 1♀, Olympia, June 11, 1895, June 24, and July 4, 1896.

Specimens of *gemula* have also been identified from the following localities: Arizona—Catalina Mts.; Illinois; Montana-Helena (Aug.); Nebraska—Omaha, Sioux County and War Bonnet Canyon; New Brunswick—St. John; New York—Taughannock (July); Nova Scotia-Digby (Aug.); Ohio—Marietta, Put-in-Bay, Smithfield; Quebec—Covey Hill Sq., Hull, Aylmer, Ironside, Montreal (June-Aug.); South Dakota—Custer; Vermont; West Virginia—Greer; and Wyoming—Big Horn Mts., and Yellowstone Park (July).

Several names have been proposed for this species, due to its variability, in occupying so wide a geographic range. Most of these varieties seem to be nothing more than individual variations in color of pubescence, and this range seems to be observable in any given locality, making it impossible to recognize them even as geographic races. Therefore *M. avara* Cresson, *M. vancouverensis* Provancher, and *M. albula* Lovell and Cockerell, all described in the male sex, have been reduced to synonyms. Two variations found in the female sex may or may not represent true geographical races or varieties. Descriptions and records of these follow.

Flower records.—*Rudbeckia* sp., *Campanula rotundifolia, Baptisia tinctoria, Coreopsis* sp., *Gerardia* sp., *Pycnanthemum* sp., *Solidago lanceolata, Apocynum androsaemifolium, Asclepias speciosa, Trifolium* sp., *Rubus* sp., *Geranium maculatum, Vicia* sp., *Hydrangea* sp., *Philadelphus* sp., *Rhododendron catawbiense, Chrysanthemum leucanthemum.*

Megachile (Delomegachile) gemula var. **cressonii** Dalla Torre

Megachile carbonaria Cresson (nec Smith), Trans. Am. Ent. Soc., VII, p. 208, 1879. Cresson, Mem. Am. Ent. Soc., I, p. 119, 1916.

Megachile cressonii Dalla Torre, Cat. Hym., X, p. 427, 1896. Friese, Das Tierr. Lfg. 28, Apidae I, p. 236, 1911.

Female.—Although quite distinct from typical *gemula* due to its entirely deep black pubescence, there is no observable structural difference, and it seems probable therefore that it is a melanistic form of *gemula* rather than a distinct species. The type series, consisting of two specimens, was from Nevada. Since they were described, five other specimens have been found, from Arizona and Washington.

Type.—Female: Nevada. [A.N.S.P., no. 2420].

Range.—This variety is entirely western in occurrence. Recent records include the following: 3 ♀, Oslar, Santa Catalina Mts. Arizona, June 26, 1917. [T. H. Frison], 2 ♀, Olympia, Washington, July 2 and 4, 1896, (on lupine), [A.N.S.P].

Megachile (Delomegachile) gemula var. **fulvogemula** new variety

Female.—Similar to *gemula* s. str. except that the scopa is largely or entirely orange.

Type.—Female; Cloudcroft, New Mexico. June 18, 1902. [A.N.S.P., no. 4166].

Paratypes.—1 ♀, topotypical, June 17, 1902, [Mitchell]. 1 ♀, Olympia, Wash., June 2, 1894, [A.N.S.P.]. 1 ♀, Shawnigan, B. C., July 24, 1904, [A.N.S.P].

Two specimens not now on hand have also been recorded, one from Colorado (July) and the other from Vernon, British Columbia, July 20, 1920 (N. L. Cutler) [Can. Dept. Agr.]. In the latter specimen the scopa is black at the extreme sides of each segment and the pubescence of the clypeus is blackish. In the paratype from Shawnigan, B. C., the clypeus is largely black pubescent, but the scopa is entirely orange. In the type and the remaining paratypes the scopa is entirely orange and the pubescence of the clypeus entirely pale. In typical *gemula* there is a tendency to pale pubescence on the clypeus in western material, whereas in eastern material there is usually an intermixture of light and dark hairs on the clypeus.

Megachile (Delomegachile) giliae Cockerell (Pls. VIII and IX)

Megachile giliae Cockerell, Am. Mus. N. Y. Bull., XXII, p. 452, 1906.

This species is very close to *M. circumcincta* of the Palaearctic region, but no very definite opinion as to the status of *giliae* can be formed until the female has become known and compared with the female of *circumcincta*.

Male.—Size: Length 10 mm.; breadth of abdomen 3.5 mm.; anterior wing 7.5 mm.

Structure: Face very slightly broader than long; eyes very slightly convergent below; clypeal margin straight, with only a few very minute median irregularities; mandible 4-dentate, outer margin regularly curved in dorsal view, inferior projection subbasal, acute, inferior margin of mandible without a median angle; basal joint of flagellum slightly longer than the second joint, and the latter slightly longer than the pedicel, the apical joint flattened and somewhat dilated; lateral ocelli subequally distant from eyes and edge of vertex; vertex nearly flat; cheeks broader than eyes, lower margin of inferior concavity produced into a low carina-like projection; front coxae bare anteriorly, each with a rather large dense patch of short yellowish-ferruginous bristles in front of the much flattened, apically rounded spine which is quite broad and fully twice as long as broad; front femur slightly keeled beneath apically; front tarsi dilated and flattened, the metatarsus subequal to the second to fourth joints in length, very slightly broader apically than at base, the anterior margin with a

rather shallow excavation, the apex only slightly produced; mid and hind metatarsi about twice as long as broad; second and third abdominal terga with shallow basal grooves, the apical margins of the second to the fifth somewhat depressed, more so laterally and on the more apical segments; carina of sixth tergum very low, with a very small or indefinite median emargination, with a few slight irregular crenulations on each side, apical margin of the tergum with carina-like median teeth which are nearer the obscure lateral angles than to each other; seventh tergum robust, with a small median triangular protuberance.

Sternites: Emargination of fifth presternite broad and deep, lateral portions narrow, median portion with a slight median projection, medasternite almost divided medially, covered with fine evenly distributed setae, poststernal strip broadly incurved, more evident laterally; lateral portions of sixth presternite much longer than broad, demarked from the median portion by distinct ridges, medasternal areas distinct, broad at inner end, constricted laterally, widely separated, with long flexed setae, posternal lobe prominently outcurved medially, latero-apical angles produced, acute.

Genital armature.—Stipites slightly constricted above base, tip of each with a small narrowed apical projection and a ventral subapical tuft of setae, the sagittae apically membraneous in part, tips considerably exceeding the stipites, the volsellae rounded apically.

Puncturation: Fine and close on cheeks, vertex medially, scutellum, pleura, and over most of mesonotum; somewhat more coarse and sparse on vertex laterally and mesonotum medially; minute and indistinct on abdomen, somewhat more sparse toward the fifth tergum, slightly closer on the sixth.

Color: Black; antennae piceous; tegulae bronzy-ferruginous; wings subhyaline, very faintly clouded apically, the nervures ferruginous; front femur black on posterior face, yellowish-ferruginous on upper face, the anterior face more yellowish, with dark stripes along the upper and lower margins, at least toward the base; front tibia black on outer face except for the yellow apex, yellowish-ferruginous on the other two faces; front tarsi yellow, a dark spot on second joint beneath; mid and hind legs black, the spurs yellowish.

Pubescence: White or pale ochraceous on head, thorax, legs and the first three abdominal segments, but with a few inconspicuous dark hairs on vertex laterally and behind eyes, and front tibiae with a few short dark hairs anteriorly; fourth and fifth abdominal terga with rather long conspicuous dark pubescence, that on the sixth thin and pale, the fourth and fifth with more or less obscure white apical fasciae, the third with evidences of one toward the sides; front tarsal fringe white, ochraceous beneath; mid and hind metatarsi with rather distinct fringes of long white hairs.

Type.—Male; Florissant, Colorado. (S. A. Rohwer, on *Gilia*). [Cockerell].

Range.—Alaska and Mackenzie, South to Colorado, June and July. Definite records include the following:

BRITISH COLUMBIA: 1♂, Invermere, Sainfoin Bank, May 27, 1915.

COLORADO: 1♂, Boulder, July 26, 1925, (C. P. Custer). 1♂, Boulder County, Aug. 1, 1925, (Hicks). 1♂, Ward, June 25, 1922. 1♂, Princeton Hot Springs, June 16, (Char. Wagner).

MACKENZIE: 1♂, Fort Simpson, Mackenzie River, June 22, 1922, (C. H. Crickmay).

Specimens have also been identified from the following localities: Alaska —Skagway (July); Alberta—Banff.

Megachile (Delomegachile) ingenua Cresson (Pls. VIII and IX)

Megachile ingenua Cresson, Trans. Am. Ent. Soc., VII, p. 122, 1878. Friese, Das Tierr., Lfg. 28, Apidae I, p. 239, 1911. Cresson, Mem. Am. Ent. Soc., I, p. 120, 1916.

Megachile tephrosiana Mitchell, Psyche, XXXIV, p. 179, 1927.

Female.—Size: Length 13 to 15 mm.; breadth of abdomen 4.5 to 5 mm.; anterior wing 9 to 10 mm.

Structure: Face somewhat broader than long; eyes subparallel; clypeal margin entire, very slightly and broadly outcurved; mandible 4-dentate, the teeth very low, the inner one very broadly truncate, a cutting edge between the third and fourth, and a vestige of one between the second and third; lateral ocelli subequally distant from eyes and edge of vertex; vertex nearly flat; cheeks broader than eyes; second and third abdominal terga rather deeply grooved basally, the fourth much less so, apical margins of the second to the fifth distinctly depressed except on the second medially, the sixth straight in profile.

Puncturation: Fine and close on cheeks and pleura, and at extreme sides of clypeus; more deep and distinct on vertex and dorsum of thorax, sparse on the vertex laterally and on mesonotum and scutellum medially; clypeus and supraclypeal area with a median impunctate area, the punctures rather fine and irregular on either side of these; fine and quite close on abdomen basally, becoming slightly more distinct toward the fifth tergum, deeper and very close and fine on the sixth.

Color: Black; antennae beneath and tegulae dark red to piceous; wings lightly infuscated basally, somewhat more deeply so apically, the nervures piceous to black; spurs dark red or ferruginous.

Pubescence: Mostly white on head, thorax, legs, and on first abdominal segment, but black on vertex, mesonotum and scutellum, with a narrow fringe of black on cheeks back of eyes; short and black on second to sixth abdominal terga, the second to the fifth with entire white apical fasciae, that on the second rather thin medially; scopa white, but black on the sixth sternum and across the apical portion of the fifth.

Male.—Size: Length 10 to 12 mm.; breadth of abdomen 3.7 to 4 mm.; anterior wing 8 to 9 mm.

Structure: Face slightly broader than long; eyes very slightly convergent below; clypeal margin straight, with some fine irregular crenulations medially; mandible 4-dentate, outer margin evenly curved in dorsal aspect, inferior projection basal, a small acute angle on inferior margin just basad of center, the edge from this to the acute apex of the inferior projection flattened and slightly excavated; basal joint of flagellum longer than pedicel, subequal to the second joint, the apical one flattened and very slightly dilated; lateral ocelli subequally distant from eyes and edge of vertex; vertex nearly flat; cheeks broader than eyes, lower margin of inferior concavity with a short and rather broad, slightly excavated projection; front coxae finely pubescent anteriorly, without red bristles, the spines very short, hardly longer than broad at base; front femora slender; front tarsi flattened, slightly dilated, the metatarsus subequal to joints two to four in length, slightly broader apically than at base, the apex slightly produced, anterior margin very slightly excavated; hind metatarsi slender; second to fourth abdominal terga somewhat grooved across base, apical margins of the second to the fifth quite deeply depressed, but only slightly so on the second medially; carina of sixth tergum with a somewhat irregular and variable median emargination, irregularly dentate or crenulate on each side, apical margin of the tergum with small acute median teeth which are nearer the obscure lateral angles than to each other; seventh tergum visible, somewhat produced medially into a broadly triangular projection.

Sternites: Emargination of fifth presternite broadly arcuate, the lateral portions triangular in outline, median portion nearly linear, medasternite reduced, ovoid in outline, but the apical margin nearly straight, covered with fine setae, poststernal strip linear, slightly incurved medially; lateral portions of sixth presternite long and narrow, somewhat angulate apically, the medasternal areas abruptly broadened at inner end where they are densely setose, bare, linear and heavily sclerotized laterally, poststernal lobe broadly and deeply incurved medially, resulting in a pair of acute wing-like lobes.

Genital armature: Stipites abruptly constricted above base, tips subacute, each with a ventral subapical knob, sagittae relatively straight, tips membraneous in part, much exceeding the stipites, volsellae emarginate apically.

Puncturation: Very fine and close on pleura, and extremely so on cheeks below; more coarse deep and distinct on vertex, mesonotum and scutellum, rather sparse on vertex laterally and on mesonotum medially; minute and indistinct on abdomen, rather close basally, becoming more sparse toward the fifth tergum, these more apical terga shining, the sixth with extremely minute and indefinite punctures and with scattered small tubercles.

Color: Black; antennae and tegulae piceous, the latter polished; wings very lightly infuscated, very slightly more so apically, the nervures dark ferruginous to piceous; front femur black except for the polished anterior face which is yellowish-ferruginous in part; front tibia dark except for the partly yellowish-ferruginous posterior face; front tarsi pale yellow, more or less rimmed with fuscous anteriorly and darker beneath; mid and hind legs black, the spurs dark ferruginous or piceous.

Pubescence: Mostly white on head, thorax, legs, and the first and second abdominal segments, but vertex and mesonotum with considerable fuscous pubescence, and front tibiae with some short dark hairs anteriorly; black on discs of third to sixth abdominal terga, the second to the fifth with entire white apical fasciae; front tarsal fringe thin and entirely white.

Type.—Male; Georgia. [A.N.S.P., no. 2467].

Range.—Georgia to Pennsylvania, during June. Records include the following:

ILLINOIS: 1♂, no locality record.

INDIANA: 1♀, June 8, 1930, (E. Goehlner).

NORTH CAROLINA: 1♂, Benson, May 20, 1925 (on *Tephrosia*). 1♂, 6♀, Harnett County, June 5, 1931, (on *Tephrosia*). 1♀, Kenansville, May 20, 1934, (on *Tephrosia*). 1♂, 1♀, Raleigh, May 30, 1931 (on *Tephrosia*). 1♀, Tarboro, May 28, 1925, (on *Tephrosia;* described as *M. tephrosiana* n. sp.); (all Mitchell).

A specimen has been identified also from Carlisle, Pennsylvania, (June).

Flower records.—This species seems to be limited to *Tephrosia virginiana.*

Megachile (Delomegachile) melanophaea Smith (Pls. VIII and IX)

Megachile melanophaea Smith, Cat. Hym. Brit. Mus., I, p. 191, 1853. Provancher, Nat. Can., XIII, p. 232, 1882. Provancher, Pet. Fauna Ent. Can., p. 715, 1883. Cockerell, Trans. Am. Ent. Soc., XXXI, p. 336, 1905. Lovell and Cockerell, Psyche, XIV, p. 18, 1907. Friese, Das Tierr., Lfg. 28, Apidae I, p. 240, 1911. Cockerell, Occas. Pap. Mus. Zool. Univ. Mich., XXIII, p. 4, 1916.

Megachile femorata Provancher, Nat. Can., XIII, p. 228, 1882. Provancher, Pet. Fauna Ent. Can., p. 712, 1883.

Megachile canadensis Friese, Zeit. Syst. Hym. Dipt., III, p. 248, 1903.

Xanthosarus melanophaea Titus, Proc. Ent. Soc. Wash., VII, p. 153, 1905.

Megachile (*Xanthosarus*) *melanophaea* Viereck, Conn. Nat. Hist. Surv. Bull., XXII, p. 742, 1916.

Female.—Size: Length 12 to 14 mm.; breadth of abdomen 4 to 4.2 mm.; anterior wing 8 to 9 mm.

Structure: Face about as broad as long; eyes subparalled; clypeal margin straight, very minutely crenulate; mandible 4-dentate, inner tooth rounded, but the tip very slightly emarginate; second joint of flagellum subequal to the pedical, the basal joint somewhat longer; lateral ocelli very slightly nearer edge of vertex than to eyes; vertex nearly flat; cheeks broader than eyes; abdominal terga but very slightly depressed either basally or apically, the apical depressions more evident laterally, the sixth tergum straight in profile.

Puncturation: Fine and close on cheeks, clypeus laterally, pleura, and extreme sides of mesonotum and scutellum; rather close and deep on vertex medially; more sparse but fine on clypeus medially; quite sparse on vertex laterally and on mesonotum and scutellum medially, these areas shining; minute and indistinct on the shining abdomen, sparse on the more apical terga, deeper, more distinct, and close on the sixth.

Color: Black; antennae more piceous beneath; tegulae black; wings faintly infuscated basally, more deeply so apically, the nervures piceous; spurs ferruginous.

Pubescence: Creamy-white on face and clypeus, first and second abdominal segments, and over most of thorax; blackish or fuscous in large part on legs, and on the third to the sixth abdominal terga, the mesonotum usually with a large patch of black pubescence and the sternum with largely dark pubescence which sometimes extends upward onto the pleura, the cheeks and vertex variable, but usually with more or less intermixed light and dark pubescence; third abdominal tergum with some pale pubescence across base, the sixth with subappressed tomentum in addition to the erect black hairs; no abdominal fasciae at all evident; scopa bright red, often darker toward base.

Male.—Size: Length 9 to 12 mm.; breadth of abdomen 3 to 4 mm.; anterior wing 7.5 to 9 mm.

Structure: Face about as broad as long; eyes subparallel; clypeal margin irregularly and finely crenulate medially, nearly straight; mandible 4-dentate, outer margin in dorsal view distinctly angulate near center, inferior projection basal, triangularly acute, with a slight angle toward the apex of mandible; basal joint of flagellum longer than pedicel, subequal to the second joint, the apical one dilated and flattened, nearly as broad as it is long; lateral ocelli subequally distant from eyes and edge of vertex; vertex nearly flat; cheeks broader than eyes, inferior concavity margined beneath by a round carinate protuberance; front coxae bare anteriorly, the spines flattened, not much longer than broad at base, a dense patch of short ferruginous bristles in front of each; front femur slightly keeled beneath apically; front tarsi broadly dilated and flattened, the metatarsus nearly equal to the second to fifth joints combined in length, deeply hollowed on anterior margin, more broadly dilated apically, and the apex somewhat produced over the second joint; mid and hind metatarsi about twice as

long as broad; second and third abdominal terga grooved basally, apical margins of the second to the fifth broadly and slightly depressed, very slightly so medially; carina of sixth tergum with a deep semicircular median emargination, irregularly dentate on each side, apical margin of the tergum with robust flattened median teeth which are slightly nearer the minute lateral angles than to each other; seventh tergum robust, produced medially into a conspicuous spine-like projection.

Sternites: Emargination of fifth presternite very broad and deep, lateral portions longer than broad, median portion distinctly linear, medasternite broad, slightly overlapping the presternite laterally, apical margin incised medially, closely covered with short fine setae, poststernal strip obscure, broadly incurved; lateral portions of sixth presternite much longer than broad, rounded and conspicuously setose apically, medasternal areas broad and approximate medially, finely and densely setose, attenuate laterally, poststernal lobe very broad, the latero-apical angles produced into conspicuous rounded lobes.

Genital armature: Stipites rather abruptly constricted above base, more slender apically, tip incised and slightly dilated, bilobate; sagittae slender and more or less compressed apically, tip much exceeding the stipites; volsellae triangular, subacute apically.

Puncturation: Fine and close on cheeks, pleura, on vertex medially, and on extreme sides of mesonotum and scutellum; more coarse and sparse on vertex, mesonotum and scutellum medially; minute and indistinct on the shining abdomen, more close basally, quite sparse toward the fifth tergum, shallow, but more coarse and numerous on the sixth.

Color: Black; antennae black or piceous beneath; tegulae dark ferruginous; wings faintly infuscated basally, slightly more deeply infuscated apically, the nervures dark ferruginous to piceous; front femur dark on posterior face except for the yellowish area near the keel, yellowish-ferruginous on the other two faces; front tibia black on outer face except for the yellow apex, yellowish-ferruginous on the other two faces; front tarsi entirely yellow; mid and hind legs dark, the spurs ferruginous.

Pubescence: Whitish on head, thorax, legs, and first two abdominal segments; more yellowish on outer face of mid metatarsus; some inconspicuous black pubescence on hind femora and tibiae posteriorly; black on fourth to sixth abdominal terga, the third black across the apical portion, white basally; front tarsal fringe white basally, fuscous apically beneath, margins of the metatarsal scale fringed with brown and a few long fuscous hairs near base of femur beneath.

Type.—Female; Nova Scotia, (Lieut. Redman). [British Museum].

Range.—California, Arizona and New Mexico, north through Canada to Mackenzie, east to New England, Nova Scotia and Newfoundland. Definite records are as follows:

ALBERTA: 1♀, Banff, July 5, 1905, (J. McFarland). Identified also from Bilby, Calgary, Edmonton and Lethbridge.

ARIZONA: 1♂, Mt. Lemon, St. Catalina Mts., 9150 ft., July 27, 1917.

BRITISH COLUMBIA: 1♂, Bear Lake, (A. N. Caudell). 1♀, Fort McLeod, Aug. 1882. Identified also from Invermere, Kaslo, Okanagan, Penticton, Vaseaux, Vernon.

CALIFORNIA: 2♂, G. Alpine Cr., Tahoe, July 2 and 3, 1915, (E. P. Van Dyke). 1♂, Strawberry Valley, El Dorado County, Aug. 13, 1912, (E. C. Van Dyke). Identified also from Lake Tahoe (June), Phillips (Aug.) and Placer County.

COLORADO: 3♂, 5♀, no locality record. 32♂, 27♀, Boulder County, Apr. 19-Aug. 2 (Custer and Hicks). 2♂, 1♀, Creede, 8844 ft., Aug. 1914, (S. J. Hunter). 1♀, Elbert, July 9-11, 1922, about 7400 ft. alt. 1♂, Elbert, June 2, (Figgins). 1♀, Leadville, Aug. 3-5, 1919, about 10,300 ft. 2♂, 3♀, Tennessee Pass, July 30-Aug. 8, about 10,500 ft. 2♂, Ute Creek, 9,000 ft., July 8, (H. S. Smith). 1♀, Ute Creek Sage Flats, July 19, (H. S. Smith). 2♂, Ward, June 25, 1922, about 9300 ft. 1♀, Ward, June 21-22, (G. H. Young; on Dandelion). Specimens have also been identified from the following localities: Aspen, Bogen Park, Electra Lake, Estes Park, Glenwood Springs, Gothic, La Veta, Malta, Manitou, Mary's Lake, Moraine Park, Ouray, Pagosa Springs, Pikes Peak, Pine Cliff, Pingree Park, Platte Canyon, Ridgeway, Russell, Sedalia, Sierra Blanca, Starkville, Telluride and Villa Grove.

GEORGIA: 2♀, no locality record.

MAINE: 3♂, Old Orchard, June 6, 1921, (on *Azalea*). 2♂, Old Orchard, June 17, 1925, (on Legume). 8♂, Saco, June 17, 1925, (on *Rhodora*); (all Mitchell). Also identified from Bar Harbor, Berwick, Eastport, Machias, Mt. Desert, Monmouth, Norway, Salisbury, S. W. Harbor, Travellor Mt., and Waldoboro.

MASSACHUSETTS: 2♂, 1♀, no locality record. 1♂, Southampton, July 11, 1894. 2♀, Forest Hills, June 3, 1927, (Mitchell; on *Vicia*).

MICHIGAN: 1♂, 3♀, Pequaming, July 2 to Aug. 1, 1903. 1♀, Point Abbaye, July 2, 1903; (both Morgan Hebard). Identified also from Ann Arbor (July) and Douglas Lake (June).

MONTANA: 1♀, Moccasin, Aug. 15, 1915, (LeR. Moomaw: on Alfalfa). Identified also from Beaver Creek, Big Fork, Pondera County and Powell County.

NEBRASKA: 2♂, 2♀, War Bonnet Canyon. Identified also from Hat Creek, Monroe Canyon (July), Pine Ridge (May) and Sioux County.

NEW HAMPSHIRE: 1♂, no locality record, (W. J. Fox). 1♂, Franconia. 1♀, Ramsey, July 25, 1926, (Darlington). Identified also from Bartlett, Hanover, Jackson and Kearsarge.

NEW MEXICO: 5♂, 3♀, Cloudcroft, May 23 to July 19, 1902. 1♂, top of Las Vegas Range, June 28, 1902. 1♂, Mad Baily Canyon, June 26.

NEW YORK: 2♂, Axton, Adirondak Mts., June 12-22, 1901, (A. D. Macg. and C. O. H.) 1♂, Ithaca, June 25, 1928, (P. P. Babiy). Also identified from Taughannock Falls (July).

OREGON: 1♂, Cloud Cap Inn to Elk Cove, Mt. Hood, 6000 ft., Aug. 20, 1927, (H. A. Scullen). 1♂, E. Side Mt. Hood, July 6, 1927, (Darlington). 1♂, White Branch Meadow, Three Sisters, Frog Camp, 5,500 ft., July 19, 1927, (H. A. Scullen).

UTAH: 1♂, Silver Lake, June 16.

WASHINGTON: 1♂, Mt. Ranier, Aug. 1895, (C. V. Piper). 2♂, Olympia, June 24 and 29, 1895 and 1896. 1♂, Paradise Valley, Mt. Ranier, July 17, 1920, (E. C. Van Dyke). Identified also from Waldron Is.

WISCONSIN: 1♂, Milwaukee County.

Specimens of *melanophaea* have also been recorded from the following localities: Connecticut-Colebrook, (June): Mackenzie — Fort Norman; Manitoba—Winnipeg; Minnesota—Duluth (July); New Brunswick; Newfoundland—Table Mt. (Aug.); North Dakota—Bowman, Cavalier, Dickinson, Devil's Lake, Gascoyne, Mott, Rugby, Walhalla and Williston: Northwest Territory; Nova Scotia-Digby (July), Kentville; Ontario—Guelph and Ottawa; Quebec—Charlevoix County, Montreal (July and Aug.), St. Maring; Saskatchewan — Medicine Hat; South Dakota — Hot Springs; Wyoming — Big Horn Mts., Jackson (July), New Castle and Stewart; Yukon (July).

Occupying as this species does such a wide geographical range, it shows much variation in color of pubescence especially in the female sex, and a number of names have been proposed for these variants. Individual variations in any given locality tend to obliterate the distinctions between these forms, but some of them may possibly be of local significance. These varietal names have therefore been retained, and descriptions and data for each follow. The typical form in the female sex is considered to be that occurring in eastern Canada and New England, which is characterized by the presence of considerable black pubescence on the vertex and mesonotum and by entirely pale pubescent pleura with the sixth tergum dark pubescent and the scopa red.

Flower records.—Agastche occidentalis, Astragalus bisulcatus, Azalea sp., *Campanula rotundifolia, Cypripedium reginae, Epilobium angustifolium, Helianthus* sp., *Hemalobus tenellus, Lupinus argenteus* and *L. rootkatensis, Medicago sativa, Phacelia* sp., *Psoralea argophylla, Raphanus* sp., *Rosa* sp., *Rudbeckia* sp., *Symphoricarpus occidentalis, Vicia eracea.*

Megachile (Delomegachile) melanophaea var. **wootoni** Cockerell

Megachile wootoni Cockerell, Ann. Mag. Nat. Hist., (7), I, p. 125, 1898. Cockerell, Denison Univ. Bull., XI, p. 65, 1898. Cockerell, Ann. Mag. Nat. Hist., (7), VI, p. 7, 1900. Cockerell, Entom., XXXVII, p. 7, 1904. Cockerell, Univ. Colo. Stud., IV, p. 253, 1907. Hicks, Univ. Colo. Stud., (15), III, p. 231, 1926.

This variety was first described in the male sex. The distinctions between these forms in the males are less evident, however, and no satisfactory means of separating all of them has been found.

Female.—Pleura entirely pale pubescent; vertex and mesonotum with little or no dark pubescence; sixth tergum with pale pubescence.

Type.—Male, (Wooton 57). [U.S.N.M., no. 5805].

Range.—This form is prevalent in the Rocky Mountain area. Definite records include the following:

COLORADO: 4 ♀, no locality record. 1 ♀, Creede, Aug. 1914, 8844 ft. (S. J. Hunter). 1 ♀, Manitou, June 23, 1926 (E. C. Van Dyke). 1 ♀, Silver Plume, July 10, 1897. 1 ♀, Starkville, June 13, 1919, 6,800 ft. 1 ♀, Ute Creek, July 19, 9,000 ft. (L. Bruner). Identified also from Boulder County and Pingree Park.

MONTANA: 3 ♀, 1 ♂, no locality record. 1 ♀, Moccasin, Aug. 15, 1915, (LeR. Moomaw; on Alfalfa).

NEBRASKA: 1 ♀, Bad Lands mouth of Monroe Canyon, Sioux County, June 6, 1901, (M. A. Carriker, Jr.; on *Astragalus*). 1 ♀, Crete. (F. Rauterberg).

WISCONSIN: 1 ♀, Milwaukee. Also identified from Cranmoor.

Specimens referable to this form have also been identified from Olympia, Washington.

Megachile (Delomegachile) melanophea var. **calogaster** Cockerell

Megachile calogaster Cockerell, Proc. Ac. Nat. Sc. Phil., 1898, p. 55, 1898. Sladen, Can. Ent., L, p. 304, 1918.

Megachile wootoni calogaster Cockerell, Entom., XXXII, p. 158, 1899. Cockerell, Univ. Colo. Stud., IV, No. 4, p. 253, 1907.

Female.—Pleura dark pubescent except for a more or less extensive light patch beneath wing bases, and a large patch of black pubescence in center of mesonotum, with the sixth tergum entirely dark pubescent.

Type.—Male; Olympia, Washington, June 21, 1895. [U.S. N.M., no. 4268].

Range.—This form is more typical of the Pacific coastal area, although it occurs more sparingly in the Rocky Mountain area. Definite records include the following:

CALIFORNIA: 1♀, Fallen Leaf, Lake Tahoe, June 20, 1915, (E. C. VanDyke).

COLORADO: 1♀, Boulder, June 30, 1924, (L. O. Jackson; on *Lupinus sericeus*). 4♀, Boulder County, June 9-July 18, 1925, (Hicks).

IDAHO: 1♀, Craig's Mt. 1♂, Granville.

NEVADA: 1♀, no locality record.

OREGON: 1♀, Graham, July 14, 1906. 1♀, E. Toll Gate, July 15, 1906. Identified also from Duffy Prairie and Gilmer.

WASHINGTON: 1♂, Olympia, June 24, 1895, [Homotype-Mitchell] 2♀, Seattle, (Lot 264).

Additional specimens referable to this form have been identified from the following localities: Alberta—Macleod; British Columbia—Invermere; Colorado—Pingree Park and Villa Grove; Manitoba—Averne; Ontario—Niagara Falls (June).

Megachile (Delomegachile) melanophaea var. **rohweri** Cockerell

Megachile wootoni rohweri Cockerell, Am. Mus. N. Y. Bull., XXII, p. 453, 1906.

Megachile pseudolatimanus Strand, Arch. Naturges., LXXXIII, A, 11, p. 65, 1917.

Megachile tuala Strand, Arch. Naturges., LXXXIII, A, 11, p. 66, 1917.

Female.—Pubescence of head, thorax and legs entirely pale pubescent, that on the abdomen also except for a trace of dark pubescence on the fourth and fifth segments, the sixth densely covered with pale tomentum, scopa pale yellowish, nearly white basally.

Male.—Entirely pale pubescent on head, thorax and legs, and with but a trace of dark pubescence on the fourth and fifth abdominal segments laterally.

Type.—Female; Florissant, Colorado. July, (S. A. Rohwer), [Cockerell].

Range.—Records for this form are as follows:

ARIZONA: 1♂, no additional data, [A.N.S.P.].

COLORADO: 1♀, Ward, July 7, 1922, 8,600 ft., [Am. Mus. N. Y.]. Also identified from Fort Collins, (Aug. 7).

UTAH: 1♀, Kaibut Plateau, June 29, 1928, 9,000 ft., (W. H. Thorpe), [Timberlake].

The type specimens of *pseudolatimanus* and *tuala*, which are considered here synonymous with *rohweri*, are from the San Francisco Mts., Arizona, (Krantz), [Deutsches Ent. Inst.].

Megachile (Delomegachile) melanophaea var. **submelanophaea** new variety

Female.—Cheeks, legs and pleura entirely black pubescent; vertex, mesonotum, scutellum and first and second abdominal terga entirely pale ochraceous pubescent, without black intermixture; scopa entirely deep black.

Type.—Female; Idlewild, California. June 27, 1928, (E. C. VanDyke). [Calif. Ac. Sc., no. 3615].

Paratypes.—1 ♀, topotypical, [Calif. Ac. Sc.]. 1 ♀, Rim of World, 5 miles from Big Bear Dam, Calif., July 6, 1934, (Timberlake; on *Dicentra chrysantha*). 1 ♂, Rim of World, Calif., July 4, 1934, (J. McCracken; on *Dicentra chrysantha*). 1 ♀, Big Bear Valley, Calif., July 4, 1934, (Timberlake; on *Lupinus confutus*); [all Timberlake].

One specimen from California referable to *calogaster* approaches *submelanophaea* in character in that the pleura are entirely black pubescent and the basal abdominal sterna have the scopa blackish. It seems probable therefore that intergrading forms between the most extreme variants exist. In all the forms except *submelanophaea* the scopa is red or ochraceous at least in part.

Megachile (Delomegachile) mucida Cresson (Pls. VIII and IX)

Megachile mucida (male only) Cresson, Trans. Am. Ent. Soc., VII, p. 118, 1878. Friese, Das Tierr., Lfg. 28, Apidae I, p. 242, 1911. Cresson, Mem. Am. Ent. Soc., I, p. 125, 1916. Mitchell, Psyche, XXXIV, p. 178, 1927.

Megachile mucida semimucida Cockerell, Ann. Mag. Nat. Hist., (8), IV, p. 26, 1909.

Megachile audax Mitchell, Journ. Elisha Mitchell Soc., XL, p. 161, 1924. Mitchell, Trans. Am. Ent. Soc., LII, p. 118, 1926.

The female originally described under the name *mucida* has proven to be the female of *gemula,* while the true female *mucida* was first described by Cockerell as *semimucida.*

Female.—Size: Length 13 to 15 mm.; breadth of abdomen 4.5 mm.; anterior wing 9 to 9.5 mm.

Structure: Face slightly broader than long; eyes subparallel; clypeal margin subentire, with small, indefinite and irregular crenulations; mandible 4-dentate, the inner tooth rounded, a cutting edge between the third and fourth and a trace of one between the second and third; lateral ocelli

subequally distant from eyes and edge of vertex; vertex nearly flat; cheeks slightly broader than eyes; second and third abdominal terga very slightly grooved basally, apical margins of the third to the fifth appreciably depressed only toward the sides, the sixth straight in profile.

Puncturation: Very fine and close on cheeks, face, clypeus, pleura, and over most of mesonotum and scutellum; rather close on vertex medially, but more coarse and sparse laterally, as also on mesonotum medially; scutellum with a narrow median impunctate line; minute and close over most of abdomen, especially basally, deeper but very fine and close on the sixth tergum.

Color: Black; antennae piceous beneath; tegulae blackish; wings subhyaline or faintly infuscated basally, becoming slightly more deeply infuscated apically, the nervures piceous or black; spurs piceous.

Pubescence: Pale ochraceous or creamy-white on face between antennae and ocelli, on mesonotum, scutellum, on upper portions of pleura and propodeum, and on the first abdominal segment; blackish or fuscous on clypeus, vertex, cheeks, sternum, lower portions of pleura, legs, and on the third to the sixth abdominal terga, the second being black apically, pale pubescent basally; scopa entirely black.

Male.—Size: Length 10 to 12 mm.; breadth of abdomen 3.5 to 4.5 mm.; anterior wing 9 to 9.5 mm.

Structure: Face somewhat broader than long; eyes subparallel; clypeal margin straight and entire; mandible 4-dentate, the apical tooth long, the third small, outer margin rounded in dorsal view, inferior projection basal, acute, the inferior margin slightly angulate just basad of the center; basal joint of flagellum slightly longer than pedicel, very slightly shorter than the second joint, the apical one considerably dilated and flattened; lateral ocelli slightly nearer eyes than to edge of vertex; vertex nearly flat; cheeks broader than eyes, lower margin of inferior concavity with a rounded concave projection; front coxae bare anteriorly, but each with a dense and rather large patch of ferruginous bristles just in front of the spine which is broad and flat, slightly narrowed apically, the tip rounded; front femur slightly keeled beneath apically; front tarsi quite broadly dilated and flattened, the metatarsus subequal in length to the second to fifth joints combined, the front and hind margins parallel, deeply excavated anteriorly, produced apically almost to the tip of the second joint; mid and hind metatarsi about twice as long as broad; second and third abdominal terga slightly grooved basally, apical margins of the third to the fifth broadly and slightly depressed, but this obscure on the third medially, more distinct on the fifth, and on the fourth laterally; carina of sixth tergum with a semicircular median emargination, with faint irregular crenulations on each side, apical margin of the tergum with acute median teeth which are nearer the slightly smaller lateral teeth than to each other; seventh tergum visible, produced medially into a robust triangular projection.

Sternites: Emargination of fifth presternite broad and deep, subtriangular, median portion much constricted but not at all linear, medasternite broader than long, uniformly covered with fine microscopically branched setae, apical margin medially projecting slightly beyond the poststernal strip, the latter evident only between this area and the lateral portions of the presternite; lateral portions of sixth presternite slightly arcuate, rounded apically, quite definitely demarked from the median portion, medasternal areas almost contiguous medially where they are broad, narrowed toward outer ends, densely covered with long robust setae, poststernal lobe broad, apical margin outcurved medially, latero-apical angles acute.

Genital armature: Stipites constricted above base, slightly dilated beyond this and slightly sinuate, tip produced into a narrow dorsally projecting lobe, and with a short subapical ventral transverse lobe, somewhat dilated and slightly sinuate beyond this where the inner surface is beset with short setae, with a short ventral transverse lobe just below apex, and the tip produced into a narrow dorsally directed projection; sagittae relatively straight and slender, the tips barely exceeding the stipites; volsellae obliquely truncate or emarginate apically.

Puncturation: Fine and close on cheeks, face, vertex medially, and over most of thorax; more coarse, deep and distinct on vertex laterally and mesonotum medially; minute and indistinct on abdomen, rather close basally, more sparse toward the fifth tergum, fine and close on the sixth.

Color: Black; antennae and tegulae piceous to black; wings very faintly and rather uniformly infuscated, the nervures piceous; front femur dark on apical portion of posterior face above, the anterior face with a dark stripe along upper margin, and with two distinct parallel bright ferruginous stripes toward the base, the femur otherwise yellowish-ferruginous; front tibia black on outer face except for the yellow apex, the other two faces yellowish-ferruginous; front tarsi entirely yellow; mid and hind legs black, the spurs piceous or black.

Pubescence: Mostly greyish-white on head, thorax, front legs, and on the first two abdominal segments, but the vertex with some inconspicuous short dark pubescence laterally and front tibia with some short blackish hairs on outer face; mostly black on mid and hind legs and on the third to the sixth abdominal terga; mid metatarsus with brownish fuscous pubescence on outer face, the hind metatarsus fringed with pale hairs anteriorly, all the femora more or less pale pubescent; front tarsal fringe creamy-white, fuscous beneath apically, outer anterior margin of metatarsal scale fringed with short fuscous pubescence, the inner margin fringed with short ochraceous hairs.

Type.—Male: Georgia. [A.N.S.P., no. 2424].

Range.—Texas to North Carolina and New Jersey, May and June. Definite records include the following:

NORTH CAROLINA: 2♂, no locality record, [A.N.S.P.]. 1♀, Bryson City, June 7, 1923, (J. C. Crawford; on *Tephrosia virginiana*). 1♀, Castle Hayne, Apr. 18, 1930, 1♀, Ft. Bragg, May 2, 1930. 1♀, Raleigh, May 8, 1925, (cutting maple leaf). 2♀, 7♂, Raleigh, Apr. 15-May 8, (on *Rubus*); (all Mitchell); [all Mitchell].

TEXAS: 1♂, Fedor, (Birkman). 1♂, Bexar County, Apr. 30, 1933, (Parks), [Parks].

Flower records.—Lupinus sp., *Rubus* sp., *Tephrosia virginiana.*

Megachile (Delomegachile) vidua Smith (Pls. VIII and IX)

Megachile vidua Smith, Cat. Hym. Brit. Mus., I, p. 192, 1853. Viereck, Ent. News, XII, p. 325, 1901. Viereck, Trans. Am. Ent. Soc., XXIX, p. 48, 1903. Cockerell, Trans. Am. Ent. Soc., XXXI, p. 337, 1905. Cockerell, Univ. Colo. Stud., IV, No. 4, p. 254, 1907. Friese, Das Tierr., Lfg. 28, Apidae I, p. 237, 1911. Cockerell, Occas. Pap. Mus. Zool. Univ. Mich., XXIII, p. 4, 1916. Sladen, Can. Ent., LI, p. 125, 1919. Mitchell, Trans. Am. Ent. Soc., LIV, p. 332, 1929.

Megachile frigida Smith, Cat. Hym. Brit. Mus., I, p. 193, 1853. Dalla Torre, Cat. Hym., X, p. 431, 1896. Viereck, Ent. News, XII, p. 325, 1901. Cockerell, Trans. Am. Ent. Soc., XXXI, p. 338, 1905.

Megachile scrobiculata Provancher, Nat. Can., XIII, p. 228, 1882. Provancher, Pet. Fauna Ent. Can., p. 711, 1883.

Megachile grandis Provancher, Nat. Can., XIII, p. 230, 1882. Provancher, Pet. Fauna Ent. Can., p. 713, 1883.

Megachile centuncularis Provancher, Nat. Can., XIII, p. 230, 1882. Provancher, Pet. Fauna Ent. Can., pp. 710 and 714, 1883.

Megachile monardarum Cockerell, Ann. Mag. Nat. Hist., (7), VI, p. 11, 1900. Cockerell, Psyche, IX, p. 283, 1901. Cockerell, Entom., XXXVII, p. 7, 1904.

Megachile willughbiella Cockerell, Psyche, IX, p. 283, 1901.

Xanthosarus vidua Titus, Proc. Ent. Soc. Wash., VII, p. 153, 1905.

Megachile (*Xanthosarus*) *vidua* Lovell and Cockerell, Psyche, XIV, p. 18, 1907.

Megachile (*Delomegachile*) *vidua* Viereck, Conn. Nat. Hist. Surv. Bull., XXII, p. 742, 1916.

This species is very closely allied to *M. willughbiella* of the Palaearctic region, and possibly might be considered more a geographic race of that species than a distinct species, although it is treated as distinct here.

Female.—Size: Length 12 to 15 mm.; breadth of abdomen 4 to 5.3 mm.; anterior wing 8 to 10.5 mm.

Structure: Face very slightly broader than long; eyes subparallel; clypeal margin nearly straight, median area shining and very slightly protuberant,

otherwise entire; mandible 4-dentate, inner tooth very broadly truncate, a definite but incomplete cutting edge between the second and third teeth, a complete but short one between the third and fourth; lateral ocelli subequally distant from eyes and edge of vertex; vertex nearly flat; cheeks broader than eyes; second to fourth abdominal terga quite distinctly but not deeply grooved basally, apical margins of the second to the fifth somewhat depressed, slightly more so toward the sides but only slightly so medially, the sixth tergum straight in profile and with abundant erect hair visible.

Puncturation: Minute and rather close on the shining cheeks; fine and very close on pleura above and on face between antennae and ocelli; more coarse but rather close on scutellum, on mesonotum laterally, on vertex medially, and over most of clypeus; rather sparse and deep on vertex laterally and mesonotum medially, sparse in center of supraclypeal area; minute over most of abdomen, closer basally, more sparse toward the fifth tergum, very minute and close on the sixth.

Color: Black; antennae beneath and tegulae more piceous; wings lightly infuscated basally, more deeply so apically, the nervures piceous; spurs ferruginous.

Pubescence: White and rather long and dense over most of face, clypeus, cheeks posteriorly and below, pleura, propodeum, legs, and basal abdominal segment; blackish on vertex, cheeks back of eyes, mesonotum, scutellum, and discs of second to sixth abdominal terga; more ochraceous on outer face of mid metatarsus; fourth and fifth terga usually with entire white apical fasciae, the more basal terga with interrupted fasciae or none; scopa fulvous, slightly paler basally, a few dark hairs at apex of sixth sternum.

Male.—Size: Length 11 to 15 mm.; breadth of abdomen 4 to 4.5 mm.; anterior wing 9 to 10 mm.

Structure: Face very slightly broader than long; eyes very slightly convergent below; clypeal margin with a median shallowly emarginate area which is irregularly and finely crenulate; mandible 4-dentate, outer margin in dorsal aspect rounded, inferior projection subbasal, long and subacute, inferior margin of mandible with a distinct outward projecting median angle; basal joint of flagellum longer than pedicel, subequal to the second joint, the apical one dilated and flattened, not quite twice as long as broad; lateral ocelli subequally distant from eyes and edge of vertex; vertex flat; cheeks broader than eyes, lower margin of inferior concavity with a flattened triangular projection; front coxae bare anteriorly, but with extremely large dense patches of ferruginous bristles in front of the long slender flattened apically rounded spines; front femur distinctly keeled beneath apically, the upper margin of the posterior face above the keel distinctly carinate; front tarsi widely dilated and flattened, the metatarsus deeply excavated anteriorly, considerably produced apically over the

second joint, and the length along the apical margin nearly equalling the second to fifth joints combined; hind metatarsi fully three times as long as broad; second and third abdominal terga rather deeply grooved basally, the fourth less so, apical margins of the second to the fifth more or less depressed, more so laterally and on the more apical terga; carina of sixth tergum with a definite though somewhat variable median emargination, very finely crenulate on each side, apical margin of the tergum with very low but evident median teeth which are subequally distant from each other and from the obscure lateral angles; seventh tergum evident, with a triangular flattened median protuberance.

Sternites: Emargination of fifth presternite broad and shallow, the lateral portions extensive, median portion not so much constricted, medasternite about three times broader than long, covered with fine short setae, apical margin nearly straight, poststernal strip emarginate medially, less conspicuous laterally; lateral portions of sixth presternite quite long, broader but not much produced apically, medasternal areas small, distinctly but not widely separated medially, densely and rather finely setose, poststernal lobe conspicuous, prominently outcurved medially, the latero-apical angles narrowly produced, subacute.

Genital armature: Stipites gradually constricted above base, somewhat dilated and slightly sinuate beyond this where the inner face is sparsely beset with short fine setae, with a low ventral subapical minutely pubescent knob, the apex produced into a slender finger-like setose dorsal projection; sagittae relatively straight, compressed to some degree, slightly exceeding the stipites; volsellae triangular, acute.

Puncturation: Close and fine over entire head and thorax, but somewhat more coarse on vertex laterally and on mesonotum medially; minute and indistinct on abdomen, more close basally, shallow and very close on the sixth tergum.

Color: Black; antennae piceous to black; tegulae bronzy-ferruginous; wings subhyaline or faintly infuscated basally, more deeply infuscated apically, the nervures ferruginous to piceous; front coxae and trochanters largely yellowish; front femur dark on posterior face apically, with a dark strip along the upper margin of the anterior face and two dark lines below this, the femur otherwise yellowish-ferruginous; outer face of front tibia black except for the yellow apex, the other two faces yellowish-ferruginous, usually somewhat darker than the femur; front tarsi entirely yellowish; mid and hind legs dark, the spurs yellowish.

Pubescence: Whitish or pale ochraceous on head, thorax, legs, and first two abdominal segments, with some very short and inconspicuous dark hairs on vertex laterally; fuscous on fourth to sixth abdominal terga, the third fuscous across apical margin, white basally, and the second sometimes with a slight amount of dark apically; front tarsal fringe white, golden-brown beneath, anterior margins of the metatarsal scale fringed with short fuscous hairs; mid and hind metatarsi with quite conspicuous white hair-fringes.

Type.—Female; North America. (Ent. Club., B. M., 1844-12). [British Museum].

Range.—Throughout Canada, Alaska and the northern United States, south to Virginia and North Carolina in the east, to California, Arizona and New Mexico in the west. Definite records are as follows:

ALASKA: 1♀, Eagle City. Identified also from Skagway (July).

BRITISH COLUMBIA: 1♂, Bear Lake, (A. N. Caudell). 3♂, Carbonate, July 12, 1908. 2♂, Glacier, (Mrs. Schaffer). 2♂, Kaslo, June 29, (R. P. Currie). Identified also from Ainsworth (July), Chilcotin, Glenora, Stickeen River, Summerland and Vernon (Aug.).

CALIFORNIA: 1♂, 1♀, Lake Tahoe, Aug. 21, 1916 (L. Bruner). 2♂, Meadow Valley, Plumas County, 4000-5000 ft. alt., June 30, 1924, (E. C. VanDyke). 1♀, Sierra Nevada. Identified also from Alta Meadow (9000 ft., Aug.), Lake Tahoe (Aug.) and Placer County.

CANADA: 1♂, 2♀, no locality record.

COLORADO: 4♂, no locality record. 1♂, Aspen, July 24-27, 1919, 8000 ft. 1♂, Creede, Aug. 1914, 8844 ft., (S. J. Hunter). 12♂, 8♀, Boulder County, May 12 to Aug. 9, 1925, (Hicks). 1♀, Boulder, July 22, 1922, (L. O. Jackson; on *Campanula petiolata*). 1♂, Boulder, June 30, 1924, (L. O. Jackson; on *Hemolobus flexuosus*). 2♀, Boulder, July 5, 1925, (C. P. Custer). 3♂, 2♀, Boulder County, July 19-25, 1925, (C. P. Custer). 1♂, Denver, July 8, 1897, (on garden Hollyhock). 1♀, Evergreen, July 1, 1897. 1♂, Tennessee Pass, Aug. 6-8, 1920, 10,500 ft. 1♂, Ute Creek, 9000 ft., July 24 (R. W. Dawson). 1♀, Ute Creek, 9000 ft., July 31, (L. Bruner; on *Campanula*). Identified also from Animas (June), Bear Creek, Elbert Creek (June), Florissant (July), Fort Collins, Glenwood Springs (Aug.), Malta (Aug.), Mancos (July), Meeker (July), Monta Vista (June), Moraine Park (June), Ouray (July), Pikes Peak, Pingree Park (Aug.), Stopps Lake (July), Ward (June-Aug.).

IDAHO: 2♀, Coolin, Priest Lake, July 19 and 23, 1927 (E. C. VanDyke). 1♂, Moscow Mt., (C. V. Piper). Also identified from Bear Lake (July).

MAINE: 1♂, no data. Identified from Bar Harbor, Blue Hill (July), Capens, Mt. Desert, Norway, Ognossac, S. W. Harbor, Sugar Isle and Waldoboro.

MANITOBA: 3♂, Teulon, June 23, 1920, (A. J. Hunter). Also identified from Winnipeg.

MASSACHUSETTS: 1♂, Forest Hills, July 6, 1927, (on *Vicia*). 1♀, July 8, 1926, (on *Vicia*); (both Mitchell). 1♂, Southampton, July 10, 1894.

MICHIGAN: 1♂, Douglas Lake, June 29, 1913, (M. D. Ellis). 4♂, 1♀, Pequaming, July 2 to Sept. 27, 1903. (Morgan Hebard). 1♂, Point Abbaye, July 31, 1903, (Morgan Hebard). 1♀, Roseland, July 24, 1932, (H. Pearson). Identified also from Grand Rapids.

MINNESOTA: 1♂, Trout Lake, July 25, 1932. (H. Pearson).

MONTANA: 1♂, 1♀, no locality record. 1♀, Beaver Creek, 6300 ft., Aug. 1913, (S. J. Hunter). Identified also from Helena.

NEBRASKA: 1♂, Sioux County. Identified from Monroe Canyon and War Bonnet Canyon.

NEVADA: 1♂, 2♀, no locality record.

NEWFOUNDLAND: 1♀, Port au Port, July 29, 1922. 1♀, Spruce Brook, Aug. 8-12. Identified also from Bay of Islands, Codroy, Crabbes, and Bear Lake.

NEW HAMPSHIRE: 1♀, no locality record. 4♀, Lancaster, Aug. 20-28, 1928, (Timberlake; on *Apocynum androsaemifolium*). 1♀, Mute Mountains, (Geo. Dimmock). Identified also from Durham, Glen House and North Conway.

NEW MEXICO: 6♂, 3♀, Cloudcroft, May 22, June 16 and 18, 1902. 1♀, Beulah, August 17, (H. Skinner).

NEW YORK: 2♀, no locality record. Identified from Axton (June), Ithaca, McLean, Mt. Skylight (July), Taughannock Falls.

ONTARIO: 1♂, Soo, July 23, 1932, (H. Pearson). 1♀, White R., Aug. 30, 1927, (Darlington). Identified also from Ottawa, Sudbury, Thornloe and Toronto.

OREGON: 1♂, Alsea Mount., July 4, 1930, (J. Wilcox). 1♂, Breitenbush Hot Springs, 2222 ft., July 4, 1934, (H. A. Scullen). Identified also from Corvallis, Indian Mt., Lava Lake and Mt. Hood.

PENNSYLVANIA: 1♂, North Mt. 1♂, Swarthmore, June 3, 1906. Identified also from Philadelphia.

QUEBEC: 1♀, Montreal, June 22, (C. J. Ouellet).

UTAH: 1♀, Murray, Aug. 7, 1914 (Timberlake; nesting in rotten log). 1♂, Silver Lake, July 16. Identified also from Fort Douglas (May).

WASHINGTON: 1♀, no locality record. 2♂, Olympia, July 24, 1895 and Aug. 4, 1894. Identified also from San Juan Is. (Aug.) and Umatilla.

WYOMING: 1♂, Jackson, July 13-17, 1920, 6300 ft. Identified also from Big Horn Mts., Sheridan, Stewart and Yellowstone Park; (all July).

Specimens of *vidua* have been identified from the following additional localities: Alberta—Banff (Aug.), Bear Lake, Bilby, Calgary, Cooking, Edmonton, Jasper Park (July), Lethbridge, Slave Lake: Arizona—Flagstaff, Oak Creek Canyon (Aug.); Connecticut—Colebrook; Hudson Bay; Mackenzie — Fort Norman, Fort Wrigley; New Brunswick — Dalhousie; North Dakota—Charlson, Fargo (July and Sept.); Nova Scotia—Digby (July); Quebec—Lanoraie, Levis, Montfort, Montreal, Shawbridge, Sherbrook, Tadousac; South Dakota — Hot Springs; Vermont — Newport; Virginia; Wisconsin—Clark County (July), Cranmoor, Milwaukee, Wood County (Aug.).

Flower records.—*Epilobium angustifolium, Melilotus alba, Pentstemon cynanthus, Medicago sativa, Rosa* sp., *Trifolium repens, Campanula* sp., *Astragalus* sp., *Malvastrum* sp., *Verbena* sp., *Monarda* sp., *Apocynum androsaemifolium* and *Vicia* sp.

Megachile (Delomegachile) vidua var. **appalachensis** new variety

Megachile gemula (female only) Cresson, Trans. Am. Ent. Soc., VII, p. 118, 1878. Friese, Das Tierr., Lfg. 28, Apidae I, p. 238, 1911.
Megachile vidua var. Mitchell, Psyche, XXXIV, p. 178, 1927.

This differs from typical *vidua* in both sexes in the entire absence of abdominal fasciae, and it possibly averages slightly larger than the typical form. It occurs in the southern Appalachians, ranging as far north as New York.

Type.—Female: Highlands, North Carolina. July 24, 1922. (Mitchell on *Coreopsis* sp.). [Mitchell].

Allotype.—Male: Dillard-Highlands Road, North Carolina, July 11, 1921, (Mitchell), [Mitchell].

Paratypes.—1 ♂, Highlands, North Carolina, July 25, 1922, (on *Pycnanthemum*). 1 ♀, Busick, North Carolina, Sept. 1, 1929, (on *Vernonia glauca*). 1 ♂, Highlands, July 24, 1922, (on *Pycnanthemum*). 1 ♂, Highlands, July 25, 1925, (on *Apocynum*). 1 ♂, Marion, North Carolina, Aug. 31, 1929, (on *Vernonia glauca*). 1 ♀, 1 ♂, Shining Rock Mt., North Carolina, 6000 ft., June 24, 1934, (on *Rhododendron catawbiense*). 1 ♂, Cruso, North Carolina, June 28, 1934, (on *Pentstemon* sp.); (all Mitchell); [all Mitchell]. 2 ♂, Georgia. 1 ♂, 1 ♀, New York. 1 ♂, North Carolina. 1 ♂, Virginia; [all A.N.S.P.].

Flower records.—*Apocynum* sp., *Coreopsis* sp., *Pentstemon* sp., *Pycnanthemum* sp., *Rhododendron catawbiense, Vernonia glauca.*

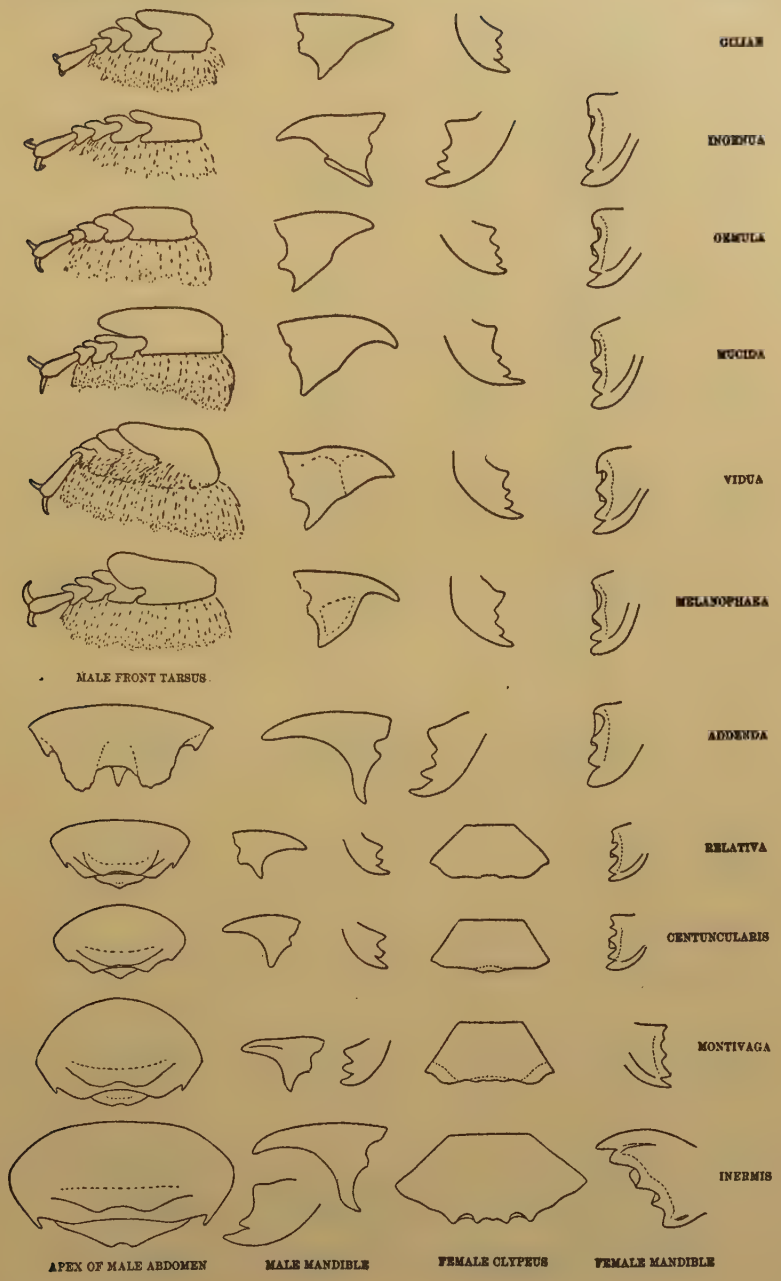
Explanation of Plates

PLATE VIII

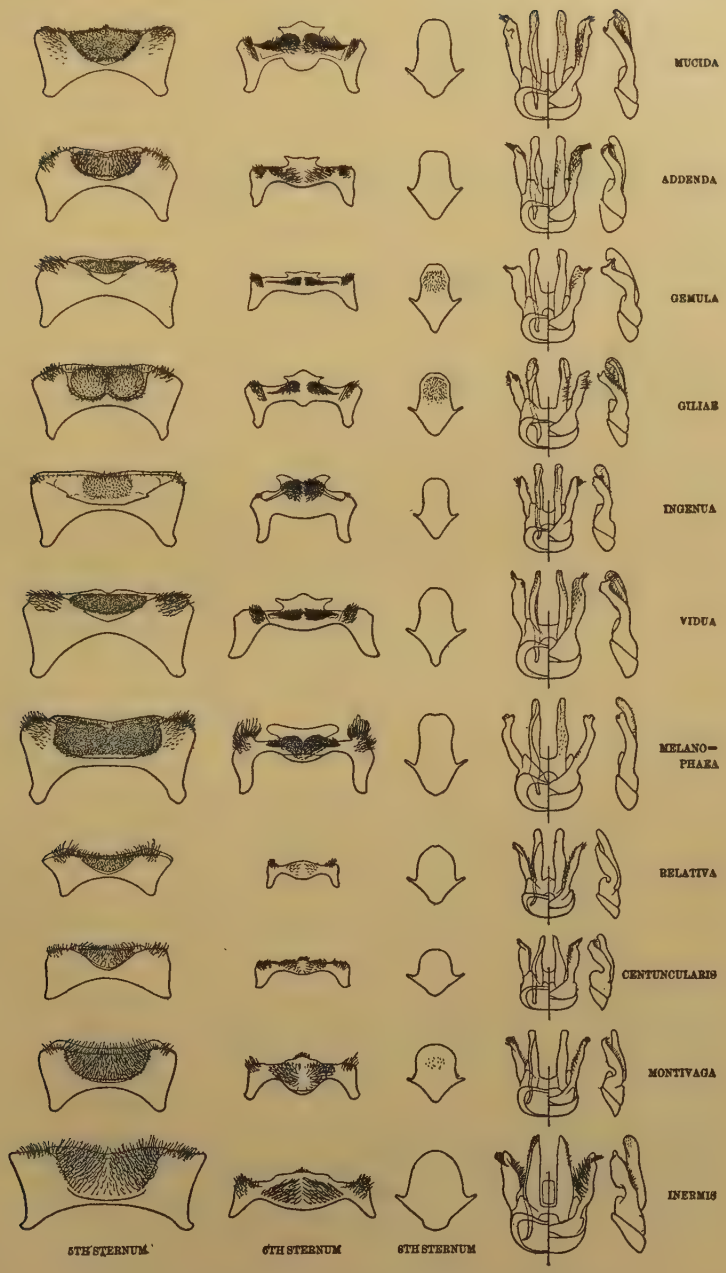
Outlines of the male front tarsus, apex of male abdomen, male and female mandibles and female clypeus.

PLATE IX

Outlines of the fifth, sixth and eighth sternum of male and of the male genital armature.



MITCHELL — NEARCTIC MEGACHILE



MITCHELL — NEARCTIC MEGACHILE

THE CHLOROPIDAE OF KANSAS[1]

(DIPTERA)

BY CURTIS W. SABROSKY

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The insect fauna of Kansas has received much attention from many students, particularly as it shows the transition from eastern to western and from northern to southern faunas. The Acalyptrate Diptera as a group, however, have long been comparatively neglected by both collectors and taxonomists in favor of larger and more conspicuous forms. In this group, at least, the state lists by Snow (1903), Crevecoeur (1905), and Tucker (1906, etc.) are very incomplete. The present paper on the Acalyptrate flies of the family Chloropidae (Oscinidae) is intended as a summary of the family as it occurs in Kansas, and also as a contribution to the study of Chloropidae of the Great Plains Region.

Since presenting this paper for publication, the author has had an opportunity to study type material in the United States National Museum, made possible by Grant No. 352 of the Bache Fund of the National Academy of Sciences; which study made necessary several corrections that should be incorporated herein. These will be found in an addenda at the end of the present paper.

Family Characters

The Chloropidae are small to minute flies, generally rather bare of bristles, with a large and conspicuous vertical triangle, weak fronto-orbital bristles, generally bare or short pubescent arista, vibrissae usually absent or not differentiated from the peristomal hairs, postvertical bristles convergent or absent, sub-

[1] Contribution No. 439 from the Department of Entomology, Kansas Agricultural Experiment Station.

costa vestigial, costa fractured but once, near the end of the first vein (R_1), anal vein and anal cell lacking, anal region of the wing entirely veinless, and the fifth vein frequently with a slight flexure in the penultimate sector. The few genera in the family Asteiidae, formerly included in the Chloropidae, are distinguished by the small triangle, loosely feathered arista, basally developed subcosta, and divergent postvertical bristles. Borboridae are readily separated by their thickened hind metatarsi, and Ephydridae by the presence of a second costal fracture, near the humeral crossvein. The general habitus of the latter families is so distinct, however, that one soon learns to separate them without recourse to technical characters.

Biology

The adults of most species of Chloropidae are commonly taken in sweeping grass and low herbage, although some (e. g., *Madiza cinerea*) are common on flowers, and the eye-gnats (*Hippelates* spp.) appear in large numbers to annoy campers and hikers by hovering about the face, ears, and hands. Individuals of this family are taken infrequently at lights. Many of the species have been reared from grasses, and the larvae of some of these are stem miners or gall formers, though others may live as scavengers in the decaying parts of the plants. The larvae of *Hippelates* and of some others are known to breed in decaying organic matter. Among the more unusual habits in the family, *Gaurax* and *Pseudogaurax* have been reared from cocoons of cecropia and brown-tail moths and from the egg sacs of spiders, in which they are probably scavengers rather than parasites. The larvae of *Chloropisca glabra* are peculiar among Chloropids in being predacious on root aphids.

The overwintering habits of most species are unknown. *Meromyza americana*, the wheat-stem maggot, passes the winter as an adult larva, occasionally as a pupa, in the stems of young wheat plants and probably in other grasses. A few adults of *Crassiseta costata*, *Crassiseta nigriceps*, and *Oscinella coxendix* have been found in hibernation at Manhattan, Kansas, and this supports the inference, based on early collecting records, that these three species overwinter as adults.

Extensive sweepings made at Manhattan by Professor Wilbur in his study of the insect fauna on native and cultivated grasses have yielded abundant material and many new records.[2] The data as a whole indicate that for most species of Chloropidae, three generations—spring, midsummer, and fall—usually occur in central Kansas, and that these generations, as judged by the collections, have rather steep curves or peaks of emergence, between which few or no individuals are to be found. Comparison of these curves with charts of temperature and rainfall at Manhattan for the corresponding years seems to show some relationship between emergence of Chloropid flies and rainfall. Chloropidae were most abundant in the bluegrass pastures, distinctly less abundant in the orchard grass-brome grass stand, and rather uncommon in the upland or native grass pastures.

The Kansas Fauna

Recent study and collecting have shown that Kansas possesses a rich fauna in this family. Published lists record twenty-two valid species from the state, in addition to ten described with Kansas as the type locality. Of the latter, two are really the same species. In sixteen of the twenty-two recorded species, the author has seen the specimens upon which the records were based, and four of these were misidentified. *Chlorops proxima* Say is a *species incerta* and is not considered in the state list. Actually, therefore, twenty-six species and nine genera were correctly recorded from the state. In this paper, fifteen genera, seventy-four species, and three named varieties are recorded from Kansas. Further collecting in the western part of the state should add to this number.

Leonard (1928) listed forty-seven valid species of Chloropidae from New York State; C. W. Johnson, in the Diptera of Smith's New Jersey List, recorded thirty-eight from that state; and Johnson (1925) found only seventy-four valid species in all

[2] A summary of this data has been prepared and presented for publication in the Journal of Economic Entomology by Wilbur and Sabrosky. The interested reader is referred to that paper for details to supplement the brief references given under the several species.

New England. Compared with these regions, which have been intensively and extensively collected by a host of entomologists over a long period, the list for Kansas is very large indeed.

Tabular Summary of the Chloropidae of Kansas

Present list		Published lists	
Species identified [3]	69 spp., 3 var.	Described from Kansas	10
Recorded in litt. but not verified [4]	5	Recorded from Kansas	22
Total recorded	74 spp., 3 var.	Total listed	32
		Total, corrected for synonymy and misidentification	26

With regard to type material, of the seventy-four species of Chloropidae recorded here, the author has personally examined the types of thirteen species, and has had specimens of thirty-one more species compared with types by other workers. In addition to these, the author has seen numerous specimens determined by leading Dipterists, such as Aldrich, Malloch, Coquillett, and Johnson.

The author gratefully extends his thanks for assistance received during the course of the work, to Dr. R. H. Painter, in particular, for advice and encouragement throughout the work, and for numerous specimens; to Dr. R. H. Beamer of the University of Kansas for his courtesy and consideration in connection with the study of types and material in the Snow Entomological Collection; to Prof. D. A. Wilbur for the privilege of examining his collections of the insect fauna of grasses, and for the gift of specimens therefrom; to Messrs. Nathan Banks and Marston Bates at the Museum of Comparative Zoology, and Mr. C. T. Greene at the U. S. National Museum for their generous cooperation in comparing specimens with the types at those museums; to Dr. H. H. Ross and Dr. C. O. Mohr for courtesies in connection with the examination of types in the collection of the Illinois Natural History Survey; and to Mr. David G. Hall of the Bureau of Entomology and Plant

[3] Not including the two species of *Euchlorops*.

[4] *Chlorops proxima* not included.

Quarantine for checking the writer's identification of various species of *Hippelates*. The work in part was in connection with Project 115B, entitled "Insects Affecting Pasture and Lawn Grasses".

The material for this study was derived mainly from the author's personal collection [C.W.S.], from the collection of Prof. D. A. Wilbur, Dr. R. H. Painter, and Dr. R. C. Smith of Kansas State College, and from the collections of the University of Kansas [Snow Colln.], the Kansas State College [K.S.C.], and the American Entomological Society [A.N.S.P.], in the records. The small amount from other sources is credited under the various species. Parentheses indicate the collector, and brackets the location, of the specimens.

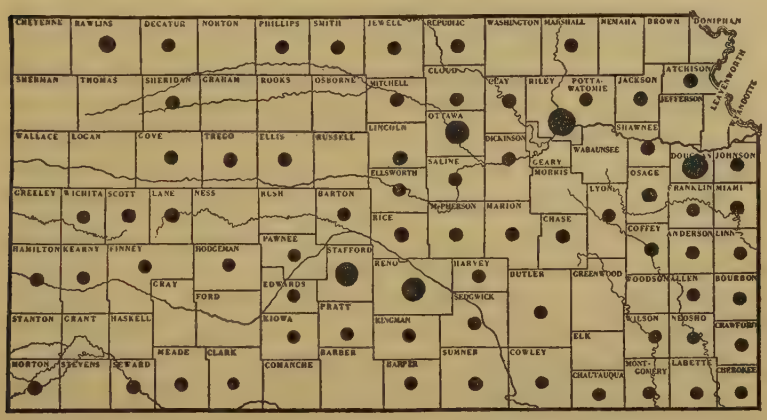

Figure 1. Map of Kansas, showing the counties from which records of Chloropidae are known to the author. The larger dots indicate the principal collecting localities.

Approximately 15,000 specimens have been identified in the course of this study, in addition to which numerous specimens of the common species were recognized and recorded in the field. The region about Manhattan, Riley County, Kansas, has been the most intensively collected from the standpoint of Chloropidae, though many fine records have been obtained by occasional collecting in such interesting localities as the Sand Dunes near Medora in Reno County, the Salt Marshes in Stafford

County, and the Ottawa County State Lake near Bennington. It is of especial interest to note that 53 species, or five-sevenths of the total recorded from the state, were collected by Professor Wilbur on grass plots at Manhattan, and that 68 species in all have been recorded in that one locality. There is no doubt that such intensive and regular collecting in other localities would add greatly to our knowledge of distribution.

General Remarks

Brief characterizations are given in some places, as a supplement to the key in presenting the characteristics of a species. In each case, reference is made to the original description, or to a redescription, in order that the student may pursue the subject in more detail if so desired, or if necessary in case of doubt. Becker's monograph of the Nearctic Chloropidae (1912) contains redescriptions, or repetitions of older descriptions, but specific reference to this work has not been made in most cases.

The two dates given for each species represent the earliest and latest records known to the author, usually for the Manhattan locality, and indicate approximately the extreme seasonal range of the species in the region. A few species may be found at any time between these dates; others, for short periods only, centering about "peaks of abundance". Where the collection "peaks" are sufficiently distinct as to indicate the probable number of generations, that point is noted.

The keys in this paper are chiefly artificial, with no conscious attempt at natural arrangement, and are intended solely for convenience in locating the species known to be found in Kansas. For the most part, they are adaptations of published keys. The long-established division of the family into two subfamilies has been used here, although Duda has recently proposed the subfamily Palaeoscinellinae to include *Hippelates* and related genera. The species actually recorded from the state are numbered consecutively throughout the paper. At the end of the Chloropinae, notes are given on two species of the genus *Euchlorops*, which is very close to the Chloropid genus *Lasiosina*, and may be traced to the family Chloropidae in the existing keys.

Key to the Genera of Chloropidae

1. Costa extending to the tip of third vein, or slightly beyond (Subfamily Chloropinae) 2
   Costa extending to the fourth vein (Subfamily Oscinellinae=Oscinosominae, Oscininae, Botanobiinae) 11
2. Large crossvein present 3
   Large crossvein absent .....*Elliponeura* Lw.
3. Hind femora greatly enlarged, the hind tibiae correspondingly bent. *Meromyza* Meig.
   Hind femora of usual size, the tibiae not strongly curved 4
4. Hind tibiae with a distinct, oval, "sensory area" on the posterodorsal surface; scutellum flattened, with distinct marginal rim; the apical pair of bristles approximated .....*Chloropisca* Lw.
   Hind tibiae without such a "sensory area"; scutellum generally more or less convex, the apical bristles not so closely approximated 5
5. Crossveins approximated, the large crossvein not more than its length, and usually much less, from the small; second and third veins arched forward, the third and fourth veins widely divergent ..*Diplotoxa* Lw.
   Crossveins not approximated, the large crossvein more than its length from the small 6
6. Disk of the mesonotum entirely black, coarsely punctured. *Epichlorops* Beck.
   Mesonotum usually striped, never coarsely punctured 7
7. Third antennal segment orbicular or nearly so 8
   Third antennal segment distinctly longer than broad 9
8. Usually bright yellow or reddish species with black stripes; third antennal segment orbicular, of normal size .....*Chlorops* Meig.
   Dark, dull yellow and black species; antennae decumbent, the third segment very small, angular .....*Anthracophaga* Lw. part.
9. Vertical triangle dull; short, broadly-built, stocky species. *Anthracophaga* Lw. part.
   Triangle polished, shining; slender, more elongate species 10
10. Triangle long and broad, convex in cross section; head distinctly produced anteriorly .....*Ectecephala* Macq.
    Triangle short, ending acutely, flat in cross section; head slightly produced .....*Parectecephala* Beck.[5]
11. Hind tibiae with a distinct, curved, shining black, apical or subapical spur .....*Hippelates* Lw.
    Hind tibiae without such a spur 12
12. Antennal arista broad and flat, or thickened and long pubescent. *Crassiseta* v. Röser
    Arista bare or only short pubescent 13

[5] Probably occurring in southeastern and eastern Kansas.

13. Only two posterior notopleural bristles 14
    Notopleural bristles very numerous; mesonotum and scutellum thickly setulose ..... *Chaetochlorops* Mall.[5]
14. Second vein unusually long, the second costal sector three to four times as long as the third sector ..... *Dicraeus* Lw.
    Second costal sector not more than twice as long as the third sector .. 15
15. Proboscis elongated, slender, geniculate, the proximal and distal portions subequal in length; vibrissal angle of the margin of the mouth somewhat produced ..... *Madiza* Fall.
    Proboscis not elongated, the distal portion short, broad and fleshy; vibrissal angle not produced 16
16. Mesonotum with three distinct longitudinal sulci ..... *Tricimba* Lioy
    Mesonotum not trisulcate, though frequently with distinct dorsocentral lines ..... *Oscinella* Beck.

Subfamily Chloropinae

ELLIPONEURA Loew

Only two Nearctic species are known in this peculiar genus, and both of them are here recorded from Kansas. Very few published records of the species have been seen by the author, and the following are therefore of special importance.

Key to the Species of Elliponeura in North America

Vertical triangle small, dull yellow, with black ocellar spot; third antennal segment yellow with black apex ..... *debilis* Lw.
Vertical triangle large, shining black; antennae large and entirely black. *diplotoxoides* Beck.

1.[6] **Elliponeura debilis** Loew

1869. *Elliponeura debilis* Loew, Berl. Ent. Zeit., XIII, p. 44. (Cent., VIII, no. 79.) [District of Columbia.]

Loew described the male of this little species, which resembles *Diplotoxa microcera* Lw., from the District of Columbia; no other records are known to the author.

1 ♂, Manhattan, Riley County, Kansas, June 18, 1930, (D. A. Wilbur; swept from red top grass), [C.W.S.]. The specimen was compared with type at the Museum of Comparative Zoology by Mr. Bates.

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[6] Species actually recorded from the state are numbered consecutively throughout the paper.

2. **Elliponeura diplotoxoides** Becker

1912. *Elliponeura diplotoxoides* Becker, Ann. Mus. Nat. Hung., x, p. 26 (Chloropidae, iv), [Idaho.]

This is another interesting species, hitherto recorded only from the type locality, Moscow, Idaho, as far as the author has been able to discover. The two specimens recorded below have paler legs than were described for the type, but they may be slightly teneral.

1♀, Ottawa County, June 24, 1934, (C. W. Sabrosky), [C.W.S.]. 1♂, Sumner County, 1916, (R. H. Beamer), [Snow Colln.].

MEROMYZA Meigen

Only one species of *Meromyza* is found throughout the greater part of Kansas, and for a long time the author believed that *M. saltatrix* did not occur in the state. One specimen was seen recently, however, from Morton County in the far southwestern corner of the state, which may be that species. Examination of considerable material from the West and Northwest has suggested the following character for use in separating the two species, which are sometimes difficult to distinguish on the basis of characters formerly employed.

Key to the Species of Meromyza in Kansas

Median anterior portion of the front with a number of irregularly arranged, distinct, black hairs; palpi generally black; vertical triangle yellow with a brownish margin; each humeral callus with a large, distinct, black spot. *saltatrix* var. *nigriventris* form *marginata* Beck.

Front usually bare of bristles, except for the marginal rows on the triangle, rarely with a few weak hairs near the apex of the triangle; palpi yellow; triangle with only the usual black ocellar spot; spots on humeral calli faint or absent ..... *americana* Fitch

3. **Meromyza saltatrix** var. **nigriventris,** form **marginata** Becker

1912. *Meromyza marginata* Becker, Ann. Mus. Nat. Hung., x, p. 25. (Chloropidae, iv.) [Idaho, Oregon.]

The above nomenclature was suggested to me by Mr. L. P. Rockwood, who has found that *marginata* Becker and *punctifer* Becker are merely seasonal color forms of *Meromyza nigriventris* Macq., now accepted as a variety of the Linnean species *saltatrix*.

Both *americana* and *saltatrix*, with its forms, are quite variable in color and pattern, and it is difficult to find good characters for their separation. In the specimens thus far examined, a hitherto unused but useful character has been found in the presence or absence of irregularly arranged, distinct, black, bristle-like hairs on the median anterior portion of the front, above the bases of the antennae and laterad of the apex of the triangle. All the forms of *saltatrix* have been observed to have from a few to a great many of these short black hairs, while typical *americana* has that portion of the front entirely devoid of such hairs. Whether this character will hold in all cases remains to be seen.

One male, Morton County, (F. H. Snow), [Snow Colln.] may belong to this species. The specimen has the black frontal hairs previously mentioned, and a slightly margined triangle, but has yellow palpi. In Becker's key, the latter fact would point at once to *americana;* however, a series of *marginata* from the western states leads the author to believe that palp color is variable and is not a constant specific criterion in this case. On the basis of the presence of frontal hairs, therefore, and pending further evidence, the specimen is recorded as *marginata* Becker.

4. **Meromyza americana** Fitch

1855. *Meromyza americana* Fitch, Second N. Y. Rept., p. 299. [New York.]

1925. *Meromyza americana* Gilbertson, S. Dak. Agr. Expt. Sta., Bul. 217, 28 pp. (Biology.)

The larva of this common and widely distributed species is the well-known wheat-stem maggot, whose activities cause the dead central tiller in young wheat, and the familiar "white-heads" in mature plants. The species has been reared from a long list of grains and wild grasses, and in this region has three distinct generations, and sometimes a partial fourth.[7] The adults, which are common in sweepings made on wheat and other grasses, are

[7] The life history of this species has been worked out by Merle W. Allen for a Master's Thesis at the Kansas State College.

long, slender, pale green to yellow flies, with gray stripes on the mesonotum, black ocellar spot, and characteristically enlarged hind femora. In the extensive collections by Professor Wilbur near Manhattan, Kansas, the species ranked third in abundance, with 1614 of a total of 11,233 specimens.

Distribution:—Common throughout the state. Recorded by Snow (1903) from Douglas and Finney Counties, and by Tucker (1907b) from Douglas County, [Record verified]. A large number of specimens have been seen from Allen, Bourbon, Butler, Chautauqua, Cherokee, Clark, Cloud, Cowley, Douglas, Ellsworth, Finney, Gove, Harper, Harvey, Hodgman, Kearney, Kingman, Labette, McPherson, Marshall, Miami, Montgomery, Ottawa, Pottawatomie, Reno, Rice, Riley, Saline, Scott, Sedgwick, Shawnee, Sheridan, Smith, Stafford, Sumner, Trego, and Wilson Counties. April 8–November 7.

CHLOROPISCA Loew

Key to the Species of Chloropisca in Kansas

1. Mesonotum without stripes, black with yellow margins 2
   Mesonotum with distinct stripes 3
2. Legs almost entirely yellow .....*grata* Lw.
   Legs mostly black .....*pullipes* (Coq.) part
3. Mesonotum yellow with reddish stripes .....*rubida* (Coq.)
   Mesonotum yellow with shining black stripes 4
4. Legs, except the tarsi, entirely yellow .....*glabra* (Meig.)
   Legs almost entirely black 5
5. Cheeks two to two and one-half times as broad as the third antennal segment; abdomen with black dorsum, the sides yellow. *appropinqua* (Ad.)
   Cheeks one and one-half times as wide as the third antennal segment; abdomen black except for the membranous venter and the hind margins of the fourth and fifth segments .....*pullipes* (Coq.) part

Chloropisca grata Loew

1863. *Chlorops grata* Loew, Berl. Ent. Zeit., VII, p. 50. Cent., III, no. 92.) [Pennsylvania.]

Snow recorded this species from Douglas County, but of his specimens in the Snow Collection at the University of Kansas, two are *Chloropisca glabra* and one is a *Chlorops* species. It has been found at numerous places in the eastern states, and as

far west as Iowa, and it may possibly occur in Kansas. A topotype from Pennsylvania, compared with the type at the Museum of Comparative Zoology by Mr. Bates, is in the author's collection.

Chloropisca rubida (Coquillett)

1898. *Chlorops rubida* Coquillett, Jour. N. Y. Ent. Soc., VI, p. 46. [Colorado, California.]

Not recorded from Kansas. It is apparently a western species, having been described from Colorado and California and recorded from Idaho. Specimens have been seen from Fort Collins and Boulder, Colorado, and the species may be found in western Kansas.

5. **Chloropisca appropinqua** (Adams)

1903. *Chlorops appropinqua* Adams, Kans. Univ. Sci. Bul., II, p. 39. [Kansas, Wyoming, Colorado.]

1912. *Chloropisca appropinqua* Becker, Ann. Mus. Nat. Hung., X, p. 32. (Chloropidae IV.) (Gen. comb.)

Appropinqua is very close to *C. glabra* in appearance, differing chiefly in the black legs, and is even more similar to *C. pullipes* (Coq.). The type series, part of which was examined at the University of Kansas, contained thirteen specimens from Hamilton, Morton, and Finney Counties, in addition to examples from Colorado and Wyoming.

It is interesting to note that of the thousands of *Chloropisca* collected in eastern Kansas, only four specimens of this species have been taken, and these at lights at Manhattan in Riley County. It would appear that Riley County is at or near the eastern limit of the range.

Distribution:—Hamilton, Morton, and Finney Counties, [Snow Colln.]. 1, Gove County, April 20, (R. H. Painter; sweeping wheat); several, Box canyon near Marquette, McPherson County, April 29, 1934, (C. W. Sabrosky and R. H. Painter); 1, Meade County, May 25, 1934, (R. C. Smith; sweeping alfalfa); several, Ottawa County, June 24, 1934, (C. W. Sabrosky and R. H. Painter); 1, near Frederick, Rice County, April 29, 1934, (C. W. Sabrosky; sweeping buffalo grass); 4, Riley County, Sept. 17(3) and Oct. 26, 1934, (H. Walkden; at trap light); several, Small Salt Marsh, Stafford County, April 29, 1934, (C. W. Sabrosky and R. H. Painter); [all A.N.S.P., K.S.C., and C.W.S.]. April 20–October 26.

6. **Chloropisca glabra** (Meigen)

1830. *Chlorops glabra* Meigen, Syst. Beschr., VI, p. 149.

1866. *Chloropisca glabra* Loew, Ztschr. f. Ent., Breslau, XX, p. 85. (Gen. comb.)

Synonyms: *assimilis* Macq., *bistriata* Walk., *halteralis* Adams, *obesa* Fitch, *trivialis* Loew.

This cosmopolitan species is very common in Kansas. It may be easily recognized by its smooth, highly polished, yellow and black appearance, the large, shining black vertical triangle, and the flattened scutellum with approximated apical scutellar bristles.

The larvae have been reported to attack the roots of various plants, but Parker (1918) showed that they are really predacious on root aphids, and are the most effective enemy of the sugar-beet root-aphis. Coquillett (1898b) recorded larvae and a puparium among the aphids on the roots of *Poa pratensis*. Near Manhattan, Kansas, on April 16, 1934, the author found one larva, agreeing with the description of *glabra*, in the soil about the roots of the grass *Andropogon scoparius*.

The adults are common in general sweepings, and the author has frequently swept them in some numbers from various flowers, especially those of the cultivated carrot, alfalfa, sweet clover, vetch, a mustard (*Sophia* sp.), *Lepidium draba*, *Prunus americana*, and *Acer negundo*. On April 23, 1934, they were observed in great numbers on the flowers of the latter, along with *Hippelates pallipes*. Whether they feed upon plant excretions, or upon the honey dew of aphids on the plants, is unknown. It is also interesting, in view of the fact that Chloropidae are seldom taken at lights, to note that out of forty-seven Chloropids captured in a trap light between April 24 and June 8, 1933, forty-three were *Chloropisca glabra*.

Distribution:—Statewide. Recorded in litt. by Snow (1903) and Tucker (1907b), as *Chlorops assimilis* Mq., from Douglas, Morton, and Sedgwick Counties, [Records verified.] Several thousand specimens have been identified, from Allen, Atchison, Barton, Bourbon, Butler, Chautauqua, Cherokee, Clay, Cloud, Cowley, Crawford, Decatur, Douglas, Ellsworth, Finney, Franklin, Gove, Hamilton, Harper, Hodgman, Kearney, Kingman, Labette, Lane, Linn, McPherson, Meade, Miami, Montgomery, Morton,

Ottawa, Pottawatomie, Rawlins, Reno, Republic, Rice, Riley, Saline, Sedgwick, Sheridan, Smith, Stafford, Sumner, Wichita, and Wilson Counties; [all Snow Colln., A.N.S.P., K.S.C., and C.W.S]. April 8–November 5.

Chloropisca pullipes (Coquillett)

1898. *Chlorops pullipes* Coquillett, Jour. N. Y. Ent. Soc., VI, p. 47. [New Mexico, Colorado.]

1912. *Chloropisca pullipes* Becker, Ann. Mus. Nat. Hung., X, p. 31. (Chloropidae, IV.) (Gen. comb.)

This species was described with two forms, as shown in the key. The striped variety is very similar to that later described by Adams as *appropinqua*, and the two may prove to be the same. Adams recognized the similarity of the two species, but founded his new species upon the characters used in the above key.

Pullipes was recorded from Morton and Finney Counties in Kansas by Snow (1903) and from Sedgwick County by Tucker (1907b), but the species is so easily confused with *appropinqua* that the records cannot be accepted without verification. Unfortunately, the specimens upon which these records were based could not be found. Typical specimens of *pullipes* have been seen in various collections from Colorado and New Mexico (the type localities), and it is quite likely to occur in western and southwestern Kansas.

DIPLOTOXA Loew

A revision of this genus in North America is nearing completion by the author, but the following key and records are presented here for the sake of completeness of the faunal list.

One new species, based in part on material from Riley County, Kansas, will be described in this revision.

Key to the Species of Diplotoxa in Kansas

1. Third antennal segment approximately circular, not longer than broad ..2
   Third antennal segment distinctly longer than broad 3
2. Small species (1.5 mm.); vertical triangle short, dull yellow except for the black ocellar spot .....*microcera* Lw.
   Larger species (more than 2 mm.); triangle mostly black, smooth and shining .....*confluens* Lw.
3. Legs predominantly black .....*nigripes* Coq.
   Legs predominantly orange or yellow 4

4. Legs with a banded appearance, due to the black bases of all femora, and narrow black bands at the apices of fore and hind tibiae. *pulchripes* Lw.
   Legs orange, generally only the fore tibiae and tarsi darkened 5
5. Third antennal segment one and one-quarter to one and three-quarters times as long as broad; dark species .....*versicolor* Lw.
   Third antennal segment two and one-half times as long as broad; pale reddish-orange species .....*alternata* Lw.

7. Diplotoxa microcera Loew

1872. *Diplotoxa microcera* Loew, Berl. Ent. Zeit., XVI, p. 108. (Cent., X, no. 95). [Texas.]

1903. *Chlorops parva* Adams, Kans. Univ. Sci. Bul., II, p. 42. [Douglas County, Kansas.]

This small, yellow, bristly species is quite unlike any other *Diplotoxa* known in North America. Indeed, Duda recently placed it in the genus *Lasiosina*, in his review of the Chloropidae for Lindner's work on Palaearctic Diptera, and it may rightly belong there. Kansas specimens have been compared with the types of both *parva* Adams and *microcera* Loew, and the former is a true synonym.

Distribution:—Uncommon in Kansas; 1, Kearney County, July, 1921, (R. H. Beamer); 4, Sedgwick County, 1916, (R. H. Beamer), [Snow Colln.]. 1, McPherson County, 1934, (R. C. Smith; on alfalfa); 13, Ottawa County, April 30 and June 24, 1934, (C. W. Sabrosky and R. H. Painter); 1, Riley County, May 3, 1930, (R. H. Painter; on wheat); 3, Riley County, June 6, 30, and October 8, 1930, (D. A. Wilbur); 8, Riley County, May 21, 26, June 9, 13, 1934, (C. W. Sabrosky); [all A.N.S.P., K.S.C., and C.W.S.]. April 30–October 8.

8. Diplotoxa confluens Loew

1872. *Diplotoxa confluens* Loew, Berl. Ent. Zeit., XVI, p. 107. (Cent., X, no. 94.) [Texas.]

The general appearance of the species is pale yellow with shining black mesonotum and triangle, and two black spots on the lower half of the pleura (on sternopleura and hypopleura), the upper half being immaculate. A cotype was examined through the courtesy of Mr. Nathan Banks.

Distribution:—Only two Kansas representatives of this southern species have been seen: 1, Harper County, 1916, (R. H. Beamer), [Snow Colln]. 1, Reno County, May 30, (Wm. P. Hayes), [K.S.C.].

9. **Diplotoxa nigripes** Coquillett

1910. *Diplotoxa nigripes* Coquillett, Canad. Ent., XLII, p. 44. [New Jersey.]

1912. *Diplotoxa major* Becker, Ann. Mus. Nat. Hung., X, p. 40. (Chloropidae, IV.) [Ohio.] (New Syn.)

Becker missed Coquillett's description, and redescribed the species as *Diplotoxa major*. It is readily distinguished from the other species of *Diplotoxa* in Kansas by the combination of black legs and somewhat elongated third antennal segment.

Distribution:—1, St. George, Pottawatomie County, June 27, 1901, (F. N. Gillis; in a marsh); 1, Riley County, October 3, (P. J. Parrott), [all K.S.C.]. 1, Riley County, July 20, 1933, (R. H. Painter); 3, Riley County, October 16, 20, and 22, 1934, (D. A. Wilbur); [all K.S.C. and C.W.S.]. June 27–October 22.

10. **Diplotoxa pulchripes** Loew

1872. *Diplotoxa pulchripes* Loew, Berl. Ent. Zeit., XVI, p. 108. (Cent., X, no. 96.) [Texas.]

Pulchripes is a generally dark brown to black species, with black-banded legs, black occiput, and very narrow yellow stripe along the upper margin of the sternopleura. Specimens from Texas and New Mexico were compared with type at the Museum of Comparative Zoology by Mr. Banks.

Distribution:—Apparently statewide: 1, Cowley County, 1916, (R. H. Beamer); 1, Decatur County, July 6, 1925, (R. H. Beamer); 1, Hodgeman County, July 17–25, 1917; 2, Kingman County, 1916, (R. H. Beamer); 1, Pawnee County, August 24, 1927, (R. H. Beamer); 19, Sedgwick County, 1916, (R. H. Beamer); 60, Sumner County, 1916, (R. H. Beamer); [all Snow Colln.]. 3, Gove County, April 20, (R. H. Painter; swept from wheat); 1, Harvey County, April 28, 1934, (C. W. Sabrosky); 1, Kearney County, July, 1921; 1, Salt Marsh, Stafford County, April 29, 1934, (R. H. Painter); 1, Riley County, May 26, 1925, (R. C. Smith; swept from alfalfa); 1, Riley County, July 14, 1926; 82, Riley County, April 30–July 26, 1930, (D. A. Wilbur; sweeping pasture grasses); [all A.N.S.P., K.S.C., and C.W.S.]. April 20–August 24.

11. **Diplotoxa versicolor** Loew

1863. *Diplotoxa versicolor* Loew, Berl. Ent. Zeit., VII, p. 53. (Cent., III, no. 97). [District of Columbia.]

This distinct species is much lighter in color than *pulchripes*, having orange legs, a broad yellow stripe on the sternopleura,

and two large yellow spots in the upper corners of the occiput. A specimen from Michigan was compared with type at the Museum of Comparative Zoology by Mr. Bates.

Distribution:—Recorded from Douglas County by Snow (1903); specimen checked in the Snow Collection. 6, Harper County, 1916, (R. H. Beamer), [Snow Colln.]. 2, Marquette, McPherson County, July 1, 1934, (C. W. Sabrosky); 3, Ottawa County, June 24, 1934, (R. H. Painter); 1, Riley County, June 30, (Popenoe); 7, Riley County, April 30, May 13, August 29, and October 8, 1930, April 27, 1932, and May 9, 1933, (D. A. Wilbur); 1, Riley County, May 24, 1934, (C. W. Sabrosky); 1, Riley County, September 17, 1934, (H. Walkden; at trap light); 1, Saline County, June 7, 1933, (C. W. Sabrosky); [all K.S.C., A.N.S.P., and C.W.S.]. April 27–October 8.

12. **Diplotoxa alternata** Loew

1872. *Diplotoxa alternata* Loew, Berl. Ent. Zeit., XVI, p. 109. (Cent., X, no. 97.) [Texas.]

Although very close to *D. versicolor* in habitus, *alternata* differs in the paler, reddish-orange color, and in having a slightly longer third antennal segment. A specimen from Texas was compared with type at the Museum of Comparative Zoology by Mr. Banks.

Distribution:—1, Douglas County, (F. H. Snow); 1, Harper County, 1916, (R. H. Beamer); 2, Sumner County, 1916, (R. H. Beamer), [all Snow Colln.]. 4, Ottawa County, June 24, 1934, (C. W. Sabrosky and R. H. Painter), [K.S.C. and C.W.S.].

EPICHLOROPS Becker

Becker recognized both *Epichlorops exilis* (Coq.) and the European *E. puncticollis* (Zett.) in North American material, but the distinction between these species, if valid, is indeed very slight. Kansas specimens agree with the description of *exilis* and are here recorded as that species.

13. **Epichlorops exilis** (Coquillett)

1898. *Eurina exilis* Coquillett, Jour. N. Y. Ent. Soc., VI, p. 45. [Massachusetts, Colorado.]

1912. *Epichlorops exilis* Becker, Chloropidae, IV, p. 28. (Gen. comb.)

The black, coarsely punctured mesonotum is one of the outstanding features of this large (4–5 mm.) and easily recognized species. The antennae are entirely black, the triangle large and glossy black, and the legs reddish-yellow with black tarsi.

Distribution:—11, Riley County, May 8 to 26, 1934, (C. W. Sabrosky); 1, Saline County, June 7, 1934, (C. W. Sabrosky); [all A.N.S.P. and C.W.S.]. May 8–June 7.

CHLOROPS Meigen

The genus *Chlorops* Meigen contains moderately large species, generally yellow with black stripes, occasionally with reddish stripes. In point of number of species, it is the largest North American genus, as far as known. Its species are easily recognized by the distinctive color patterns. The species of *Chloropisca*, which also have prominent yellow and black stripes, are distinguished by the flattened scutellum, approximated apical scutellar bristles, and the presence of a "sensory area" on the hind tibiae.

The species are seldom taken in large numbers, and are most common in sweepings on marsh and lowland vegetation, particularly along streams, sloughs, and the like. From the few rearing records, it seems that the larvae feed in or about the stems of various gresses.

A number of species have been described as distinct, based on characters which the author believes to be variations within a species. Until larger series of the less common forms have been accumulated, however, the exact relationships cannot be determined with certainty. The author fully realizes that the following key is hopelessly inadequate in this respect. A monographic revision of the genus and its relatives is in progress, as materials and opportunity offer themselves, with the hope of clearing up some of the present difficulties. Two apparently new species are present in the Kansas material now before the author, but he is unwilling to describe them until the entire group has been thoroughly studied.

Key to the Species of Chlorops in Kansas

1. Third antennal segment entirely or partly black 2
   Third antennal segment entirely orange; a pale yellow to reddish species with five conspicuous black spots, on the humeri, the mesopleurae, and the ocellar tubercle .....*quinquepunctata* Lw.
2. Vertical triangle orange to brown, with black ocellar spot and a black spot in each angle; if the spots in the lateral angles are indistinct, the triangle is reddish 3
   Triangle otherwise marked 5
3. Stripes on mesonotum black .....*palpalis* Adams
   Stripes on mesonotum reddish 4
4. Third antennal segment entirely black ...*palpalis* var. *rubrivittata* Adams
   Third antennal segment mostly reddish .....*rufescens* Coq.
5. Triangle large, yellowish to brown, with narrow black median sulcus and several deep lateral sulci on each side .....*genarum* Becker
   Not such a triangle 6
6. Triangle large, scutate, entirely yellow except for a black ocellar spot; mesonotum reddish without distinct stripes .....*unicolor* Lw.
   Triangle more or less marked with black; mesonotum yellow with black stripes 7
7. Pleura immaculate, or with only a single small black spot, on the mesopleura; rarely, the sternopleura darkened along its upper margin 8
   Pleura with four or more distinct black spots, usually on the meso-, sterno-, ptero-, and hypopleura 11
8. Vertical triangle yellow with black ocellar spot and a round black spot near the apex, occasionally the intervening area suffused with black; clypeus generally yellow in the males, brown to blackish in the females; third antennal segment usually black on the apical half or entirely black, rarely entirely orange; pleura yellow, an elliptical, shining black spot on the mesopleura .....*certima* Adams
   Triangle black with yellow margins and basal angles, or broadly black on the middle 9
9. Upper inner margin of the mouth (clypeus, in litt.) black; triangle with fine furrowing on the lateral margins .....*ruginosa* Becker
   Clypeus yellow; triangle without fine lateral furrowing 10
10. Third antennal segment entirely black; pleura sometimes with a small black spot .....*sulphurea* Lw.
    Third antennal segment black, obscurely reddish at base; pleura immaculate .....*cinerapennis* Ad.
11. Palpi yellow; antennae black, the basal segments obscurely reddish. *obscuricornis* Lw.
    Palpi black, or at least the apical portion 12

12. Antennae entirely black 13
Antennae black, the basal segments reddish to fuscous; triangle long, of moderate width, the acuminate apex extending to the anterior margin of the front .....*crocota* Lw. var.
13. Triangle short with broad base, shining black, smooth, and with concave lateral margins; legs yellow, obscurely spotted. *melanocera* Lw.
Triangle very large, extending to the anterior margin of the front, punctate, and with a deep, black median sulcus .....*fossae* Beck.

Chlorops proxima Say

1830. *Chlorops proximus* Say, Jour. Acad. Nat. Sci. Phila., VI, p. 187. [Indiana.]

Crevecoeur (1905) recorded this species from Onaga, Pottawatomie County, " swept in a low meadow the latter part of May; also taken on blossoms of *Solidago* in the pasture September 11 ". This species is not included in the present list, for it is unknown which species Crevecoeur had. The author has seen at least two distinct species determined as *proxima* by leading Dipterists.

14. **Chlorops quinquepunctata** Loew

1863. *Chlorops quinquepunctata* Loew, Berl. Ent. Zeit., VII, p. 51. (Cent., III, no. 94.) [Nebraska.]

A Kansas specimen was compared with the type at the Museum of Comparative Zoology by Mr. Bates.

Distribution:—1, Chase County, June 20, (C. O. Bare); 1, Coffey County, June 19, (H. Darby); 1, Cowley County, 1916, (R. H. Beamer); 1, Jewell County, July 10, 1926, (H. Deay); 2, McPherson County, June 28, (R. H. Beamer); 1, Scott County, June 17, (H. Deay); 1, Smith County, July 8, (R. H. Beamer); [all Snow Colln.]. 9, Riley County, May 16–July 24, 1930, (D. A. Wilbur; sweeping pasture grasses); 2, Pottawatomie County, May 20, 1934, (C. W. Sabrosky); 1, Riley County, May 20, 1933, (H. L. Nonamaker; at trap light); 3, Riley County, May 4 and 12, 1930, (H. M. Smith); 1, Riley County, May 13, 1933, (C. W. Sabrosky); 2, Riley County, June 11 and 20, 1934, (C. W. Sabrosky; the former taken on the flowers of the cultivated carrot); [all K.S.C., A.N.S.P., and C.W.S.]. May 4–July 24.

15. **Chlorops palpalis** Adams

1903. *Chlorops palpalis* Adams, Kans. Univ. Sci. Bul., II, p. 42. [Missouri.]

This is a reddish-yellow species with black stripes on the mesonotum, immaculate pleura, and triangle as described in the key. In some specimens there are distinct black spots on the pleura, but this condition is believed to be merely a variation.

Distribution:—Recorded by Tucker (1907a, b) from Douglas County in May, (record verified, in the Snow Colln.). 1, Douglas County, (F. H. Snow), mislabeled *Anthracophaga maculosa;* 1, Douglas County, June 16; [all Snow Colln.]. 1, Douglas County, June 19, 1933, (M. W. Sanderson); 2, Ottawa County, June 24, 1934, (C. W. Sabrosky); 2, Saline County, June 7, 1934, (C. W. Sabrosky); 2, Stafford County, June 30, 1934, (C. W. Sabrosky); [all A.N.S.P. and C.W.S.]. May ?–June 30.

15a. **Chlorops palpalis** var. **rubrivittata** Adams

1904. *Chlorops rubrivittata* Adams, Ent. News, xv, p. 304. [Louisiana.]
1912. *Chlorops palpalis* var. *rubrivittata* Becker, Chloropidae, iv, p. 64. (Var. rank.)

The author follows Becker in placing Adams' species as a variety of *palpalis*, differing from the typical specimens in having reddish vittae and black third antennal segment.

Distribution:—1, Douglas County, June, 1903, [Snow Colln.]. 1, Ottawa County, June 24, 1934, (C. W. Sabrosky), [C.W.S.].

16. **Chlorops rufescens** Coquillett

1910. *Chlorops rufescens* Coquillett, Canad. Ent., xlii, p. 45. [Pennsylvania, New Jersey, District of Columbia.]

Rufescens belongs to the small group of *Chlorops* species which have a reddish vittate thorax and black palpi; from the others it may be separated by an immaculate pleura and a predominantly reddish third antennal segment.

Distribution:—2, Douglas County, (F. H. Snow); 1, Douglas County, July 11, (Wm. E. Hoffmann); 1, Linn County, 1915, (R. H. Beamer); 1, Montgomery County, 1916, (R. H. Beamer); 7, Chase (2), Coffey, Franklin, Lyon, McPherson, and Osage Counties, June 8–July 26, (R. H. Beamer); [all Snow Colln.]. 1, Riley County, May, (Popenoe); 1, Riley County, June 6, 1930, (R. C. Smith; swept from alfalfa); [K.S.C.]. 3, Riley County, June 7, 1930, (D. A. Wilbur); 1, Riley County, June 8, 1933, (H. L. Nonamaker; at light trap); 1, Riley County, June 11, 1934, (C. W. Sabrosky; on flowers of cultivated carrot); 1, Riley County, June 17, 1932, (C. W. Sabrosky); [all A.N.S.P. and C.W.S.]. May ?–July 26.

17. **Chlorops genarum** Becker

1912. *Chlorops genarum* Becker, Ann. Mus. Nat. Hung., x, p. 62. (Chloropidae iv.) [South Dakota.]

This large (4 mm.) species, described from Brookings, South Dakota, is easily recognized by its dirty yellow appearance, and by the deeply furrowed vertical triangle.

In view of the extent and regularity of Professor Wilbur's sweepings, it is interesting to note the preponderance of *genarum* in the fall, and the fact that almost all of them were swept from the upland, native grass pastures.

Distribution:—24, Riley County, May 26, August 23, September 13, 16, 17, 19, 24, 27, October 3 and 10, 1930, (D. A. Wilbur; sweeping pasture grasses); [all K.S.C., C.W.S., and A.N.S.P.]. May 26–October 10.

Chlorops unicolor Loew

1863. *Chlorops unicolor* Loew, Berl. Ent. Zeit., VII, p. 51. (Cent., III, no. 93.) [Mississippi.]

Recorded by Snow (1903) from Finney County, and by Tucker (1907b) from Douglas and Sedgwick Counties. Snow's specimen was not located; however, one from Douglas County, (Snow) in the Snow Collection, determined as *unicolor* Lw., is really *Chlorops rufescens* Coq., and the other record may also be an error. The species is therefore placed in this list with some doubt, based only upon the published record. A specimen from Texas was compared with type at the Museum of Comparative Zoology by Mr. Bates.

18. **Chlorops certima** Adams

1904. *Chlorops certima* Adams, Ent. News, XV, p. 304. [Massachusetts.]

The variation in a long series of this common and widely distributed species is considerable. It may usually be identified by a single, oval, shining black spot on the mesopleura, and by two black spots, one about the ocelli and one near the apex, on the vertical triangle. These spots are frequently connected, and occasionally the intervening area is suffused with black so that it appears as a median stripe. In all material available to the author, it was found that the clypeus was yellow in the males, but brown to black in the females. A very few females were found which had a yellow clypeus, but this may have been due to the condition of the specimen.

Distribution:—1, Clark County, June, (F. H. Snow), [Arkansas Univ. Colln.]. 2, Douglas County, May 22; 1, Johnson County, 1915, (R. H. Beamer); [all Snow Colln.]. 1, Ellsworth County, June 17, 1928, (R. H. Painter); 1, Riley County, (Student Coll.); 1, Riley County, May 18, (Popenoe); [K.S.C.]. 7, Ottawa County, June 24, 1934, (C. W. Sabrosky; swept from box elder); 1, Riley County, May 15, 1933, (H. L. Nonamaker; at trap light); 1, Riley County, May 9, 1933, (D. R. Musser); 10, Riley County, May 2, July 10 (2), August 29 (5), September 9 and 27, 1930,

(D. A. Wilbur; sweeping pasture grasses); 2, Riley County, May 28 and June 15, 1932, (C. W. Sabrosky); 2, Riley County, April 28 and May 13, 1933, (C. W. Sabrosky); 4, Riley County, May 6, June 2, 9, and September 27, 1934, (C. W. Sabrosky); large series (51 pinned), Riley County, May 8, 16, and 21, 1934, (C. W. Sabrosky; all swept from a small swale, chiefly covered with slough grass, *Spartina pectinata*); [all A.N.S.P., K.S.C., and C.W.S.]. April 28–October 7.

19. **Chlorops ruginosa** Becker

1912. *Chlorops ruginosa* Becker, Ann. Mus. Nat. Hung., x, p. 62. (Chloropidae, iv.) [Michigan, Kansas, Colorado.]

From the description, it seems quite possible that *ruginosa* may be only a variety of *sulphurea* Lw., from which it differs in the color of the clypeus and in the fine lateral furrows on the vertical triangle. The type series contained material from Lawrence, Douglas County, Kansas, [Colln. Aldrich]. A Kansas specimen was compared with the type at the United States National Museum by Mr. C. T. Greene.

Distribution:—1, Douglas County, May, labeled *C. melanocera,* [Snow Colln]. 1, St. George, Pottawatomie County, May 8, [K.S.C.]. 1, Riley County, May 19, 1931, (F. H. Walker); 1, Riley County, May 13, 1933, (C. R. Collins); [C.W.S.]. May 8–May 19.

20. **Chlorops sulphurea** Loew

1863. *Chlorops sulphurea* Loew, Berl. Ent. Zeit., vii, p. 44. (Cent., iii, no. 83.) [Canada.]

Sulphurea is quickly separated from many *Chlorops* species by the pale yellow appearance of head, pleura and legs, contrasted with dull black stripes on the mesonotum, black third antennal segment, and shining black triangle, except for the lateral margins. It is not as easily distinguished from related forms (e. g., *cinerapennis* Ad.), and some of those will probably have to be placed as synonyms. The species has a wide distribution. A specimen from Michigan was compared with type at the Museum of Comparative Zoology by Mr. Bates.

Distribution: — Recorded by Becker (1912) from Lawrence, Kansas, [Colln. Aldrich]. 1, Atchison County, July 11, (R. H. Beamer); 3, Douglas County, May, recorded in litt. as *C. melanocera* by Snow (1903); 2, Douglas County, (F. H. Snow); [Snow Colln.]. 1, Ellsworth County, May 1, (R. H. Painter); 1, Riley County, May 2, (R. C. Smith); 1, Riley County, May 21, 1931, (R. H. Painter); 1, Riley County, May 2, 1930,

(H. M. Smith); [K.S.C.]. 2, Riley County, September 27, 1930, (D. A. Wilbur); 1, Riley County, May 13, 1933, (C. W. Sabrosky); [C.W.S.]. May 1–September 27.

21. **Chlorops cinerapennis** Adams

1903. *Chlorops cinerapennis* Adams, Kans. Univ. Sci. Bul., II, p. 40. [Riley County, Kansas.]
1905. *Chlorops cinereipennis* Aldrich, Catalogue, p. 633. (Emended form.)
1903. *Chlorops albifascies* Adams, Kans. Univ. Sci. Bul., II, p. 42. (Syn. by Sabrosky, 1935.) [Missouri.]
1935. *Chlorops cinerapennis* Sabrosky, Ent. News, XLVI, p. 82.

The types of *cinerapennis* and *albifascies* have been examined by the author, in the Snow Collection, and found to be identical. Both are very close to *sulphurea* Loew, and it is possible that they should go into synonymy under the older name. Practically the only difference is in the color of the third antennal segment, which is black in *sulphurea* but black with reddish base in *cinerapennis*. Antennal color is known to be valueless in some closely related species, such as *certima* Adams, but until more material has been examined, the author hesitates to place the species definitely into synonymy.

Cinerapennis was described from two specimens, Riley County, Kansas, September, (F. Marlatt), [Snow Colln.]. Two other specimens have been seen by the author; 1, Marquette, McPherson County, April 29, 1934, (C. W. Sabrosky), and 1, Ottawa County, April 30, 1933, (C. W. Sabrosky); [C.W.S.].

22. **Chlorops obscuricornis** Loew

1863. *Chlorops obscuricornis* Loew, Berl. Ent. Zeit, VII, p. 49. (Cent., III, no. 90.) [District of Columbia.]

Similar to *melanocera* Loew, but the palpi are yellow. Two Kansas specimens were compared with type at the Museum of Comparative Zoology by Mr. Bates.

Distribution:—1, Gove County; 1, Scott County, June 21, (R. H. Beamer), [Snow Colln.]. 7, Ottawa County, June 24, 1934, (C. W. Sabrosky and R. H. Painter), [K.S.C. and C.W.S.]. 1, McPherson County, June 7, 1933, (C. W. Sabrosky); 3, Sand Dunes, Medora, Reno County, June 8, 1933, (C. W. Sabrosky); 1, Riley County, May 14, 1932, (C. W. Sabrosky;; 13, Saline County, June 7, 1933, (C. W. Sabrosky); 1, Stafford County, June 30, 1934, (C. W. Sabrosky); [all A.N.S.P. and C.W.S.]. May 14–June 30.

One from Sheridan County, (F. X. Williams), and one, Coffey County, June 19, (C. O. Bare), [Snow Colln.] lack antennae, but from all appearances they belong to this species.

23. **Chlorops crocota** Loew var.

1863. *Chlorops crocota* Loew, Berl. Ent. Zeit., VII, p. 48. (Cent., III, no. 89.) [Pennsylvania.]

Kansas specimens have very dark markings on the legs, compared with material examined from other localities. A typical specimen from New Jersey was compared with type at the Museum of Comparative Zoology by Mr. Bates.

Distribution:—4, Riley County, May 5, 9, 13, and 18, 1930, (D. A. Wilbur; sweeping pasture grasses); 4, Riley County, May 6 and 16, 1934, (C. W. Sabrosky); [all K.S.C. and C.W.S.]. May 5–May 18.

24. **Chlorops melanocera** Loew

1863. *Chlorops melanocera* Loew, Berl. Ent. Zeit., VII, p. 49. (Cent., III, no. 91.) [District of Columbia.]

A specimen from Maryland was compared with type at the Museum of Comparative Zoology by Mr. Bates.

Distribution:—Recorded by Snow (1903) from Douglas County, but his specimens are really *sulphurea* Lw. 1, Riley County, May, (D. A. Wilbur); 2, Riley County, May 13, 1933, (C. W. Sabrosky); [C.W.S.].

25. **Chlorops fossae** Becker

1912. *Chlorops fossae* Becker, Ann. Mus. Nat. Hung., X, p. 52. Chloropidae, IV.) [Michigan, Kansas.]

This dark species was described in part from material from Lawrence, Kansas, [Colln. Aldrich]. It is very close to *Anthracophaga ingrata* (Will.), and perhaps should be referred to that genus. It may even be found to be a synonym of *A. ingrata*, from which it differs only in a few particulars. A Kansas specimen was compared with the type at the United States National Museum by Mr. C. T. Greene.

Distribution:—7, Riley County, May 2, 1930, April 30 and May 4, 1932, May 9 and 16, 1933, and April 24, 1934, (D. A. Wilbur; sweeping pasture grasses); [K.S.C. and C.W.S.].

ANTHRACOPHAGA Loew

The exact limits of this genus are difficult to define. The included species are large and stocky, generally dark, dull yellow and black, with angularly projecting head, unusually small an-

tennae for their body size, and in most cases black palpi. The known species are gall-formers on grasses.

All known North American species now placed in the genus have been seen by the author, and the following key has been drafted to include these. *Sanguinolenta* and *distichliae* have not been recorded from Kansas. One new species, found in the Kansas material, will be described in a projected review of the genus.

Key to the Species of Anthracophaga in the United States

1. Third antennal segment large, distinctly longer than broad (one and one-half times), the arista thick and white, with yellow base 2
   Third antennal segment small, not longer than broad, or if so, the arista is fine and brownish to black 3
2. Vertical triangle dull ash-gray; legs reddish, with brown spots; third and fourth longitudinal veins almost parallel .....*sanguinolenta* Lw.
   Triangle dull clay-yellow; legs yellow, the femora with black bases and black bands near the apices; third and fourth veins distinctly diverging .....*maculosa* Lw.
3. Triangle subshining, with a deep, black median sulcus extending from the ocellar tubercle down to the apex of the triangle ...*ingrata* (Will.)
   Triangle dull, either punctured or pollinose, without a sulcus, or the sulcus broad and shallow 4
4. Triangle dull gray, except for the yellow lateral margins, and entirely pollinose; abdominal segments dull .....*declinata* Beck.
   Triangle predominantly yellow; abdominal segments shining dark brown, only a very narrow posterior margin and a narrow lateral stripe yellow .....*distichliae* Mall.

26. **Anthracophaga maculosa** Loew

1872. *Anthracophaga maculosa* Loew, Berl. Ent. Zeit., XVI, p. 111. (Cent., X, no. 99.) [Texas.]

A dull, yellow and black species, somewhat smaller than *A. sanguinolenta*, which it resembles. *Maculosa* was recorded from Douglas County by Snow (1903), but a specimen from that county (Snow, Collector) found in the Snow Collection, and probably the basis for the published record since it was labeled *maculosa*, is really *Chlorops palpalis* Adams. However, the following specimen, also from the Snow Collection, is a typical *maculosa*, and hence the species can be recorded for the state list.

Hamilton County, July, 1921, [Snow Colln.].

27. **Anthracophaga ingrata** (Williston)

1893. *Chlorops ingrata* Williston, Ohio Agr. Expt. Sta., Tech. Ser., Bul. 1, p. 156. [Ohio.]

1912. *Anthracophaga interrupta* Becker, Ann. Mus. Nat. Hung., x, p. 44. (Chloropidae, IV.) (Syn. by Sabrosky, 1935.) [Lawrence, Kansas.]

1935. *Anthracophaga ingrata* Sabrosky, Ent. News, XLVI, p. 79. (Gen. comb.)

The deeply sulcate triangle is characteristic of this large, dark species. *Chlorops ingrata* Will. was listed as a synonym of *Gaurax anchora* (teste Coquillett) by Becker, who then redescribed the species as *Anthracophaga interrupta*, from Lawrence, Kansas, [Colln. Aldrich]. The author has examined the types of *ingrata* in the Snow Collection, and has redescribed them and indicated the above status and synonymy.

The types of *ingrata* were reared from galls on the grass *Muhlenbergia mexicana* Trin., and several specimens have been reared at Manhattan, Kansas, from other grasses of the same genus, chiefly *M. racemosa*. A description of the injury, with two photographs, is included in the paper by Wilbur and Sabrosky.[8]

Distribution:—8, Pottawatomie County, (emerged from galls on *Muhlenbergia racemosa*); 1, Marion County, and 1, Jackson County, March 26 to 31, 1934, (D. A. Wilbur; all reared in the greenhouse), [all K.S.C., A.N.S.P., and C.W.S.].

28. **Anthracophaga declinata** Becker

1912. *Anthracophaga declinata* Becker, Ann. Mus. Nat. Hung., x, p. 45. (Chloropidae, IV.) [Michigan.]

Sweeping in the upland native grass pastures near Manhattan, Kansas in the early spring almost always yields a few specimens of this dull gray species.

Distribution:—2, Douglas County, May, labeled *Chlorops pubescens* Lw. in the collection; 1, Douglas County, (F. H. Snow), [Snow Colln.]. 9, Riley County, May 13, 1933 (5), April 25, May 2 and 6, 1934, (C. W. Sabrosky; sweeping upland pastures); 5, Riley County, May 7, 1934, and May 9 and 16, 1933, (D. A. Wilbur); 2, Riley County, April 27, 1934, (C. W. Sabrosky; one taken on the flowers of a mustard, *Sophia* sp., the other on the flowers of wild gooseberry); 1, Riley County, May 19, 1934, (C. W. Sabrosky; stuck fast to the stem of the Sleepy Catchfly, *Silene antirrhina*); [all A.N.S.P., K.S.C., and C.W.S.]. April 9–May 19.

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[8] See footnote 2.

ECTECEPHALA Macquart

The closely related species which compose this small genus are often rather difficult to determine on the basis of the published descriptions.

Key to the Species of Ectecephala in Kansas

1. Mesonotum and scutellum dull dark-brown, the three stripes indistinct ..... *laevifrons* Beck.
   Thorax usually reddish, with reddish-brown stripes 2
2. Triangle with a median longitudinal sulcus ..... *sulcifrons* Coq.
   Triangle without such a sulcus 3
3. Vertical triangle very large, covering the whole vertex at base, and occupying most of the front ..... *capillata* (Coq.)
   Triangle covers only one-half to three-quarters of the width of the vertex 4
4. Third antennal segment oblong, scarcely twice as long as wide, slightly concave above; palpi black ..... *laticornis* Coq.
   Third antennal segment elongate, nearly three times as long as wide, narrowed on the apical portion to one-half its width at base; palpi yellow ..... *albistylum* Macq.

Ectecephala laevifrons Becker

1912. *Ectecephala laevifrons* Becker, Ann. Mus. Nat. Hung., x, p. 153. (Chloropidae, v.) [Onaga, Kansas; Neotropical localities.]

Although described in 1912, this species was not included in Becker's monograph of the Nearctic Chloropidae, but in the following monograph of the Neotropical forms, in which it was described from a series from Paraguay, Argentina, Texas, and from Onaga, Pottawatomie County, Kansas [Colln. Aldrich]. Duda, in reviewing the Neotropical species, placed it in the genus *Leptotrigonum* Beck., which may be a synonym of *Ectecephala*.

Ectecephala sulcifrons Coquillett

1910. *Ectecephala sulcifrons* Coquillett, Canad. Ent., XLII, p. 46. [Kansas.]

The sulcate triangle is unique among the North American species of the genus, and will separate the species at once from all others in the group.

Kansas is the type locality for this species, which was described from two specimens, Arkansas City in Cowley County, and Kinsley in Edwards County, bred by G. I. Reeves and E. G. Kelly of the Bureau of Entomology.

29. **Ectecephala capillata** (Coquillett)

1904. *Chlorops capillata* Coquillett, Proc., Ent. Soc. Wash., VI, p. 98. [Georgia, North Carolina; Neotropical.]

1912. *Ectecephala capillata* Becker, Ann. Mus. Nat. Hung., x, 71. (Chloropidae, IV.) (Gen. comb.)

This species may be recognized by the peculiarly broad vertical triangle, which covers almost the entire front. It seems to be a southern species, if all records can be accepted, for it was originally described from Georgia and North Carolina, and was recorded by Becker from Argentina.

Distribution:—1, Riley County, May 5, (R. H. Painter), [K.S.C.]. 1, Riley County, September 27, 1933, (C. W. Sabrosky); 1, Stafford County, June 30, 1934, (C. W. Sabrosky), [C.W.S.]. May 5–September 27.

30. **Ectecephala laticornis** Coquillett

1910. *Ectecephala laticornis* Coquillett, Canad. Ent., XLII, p. 46. [Colorado, Georgia, North Carolina.]

In general appearance, *laticornis* may be confused with *E. albistylum*, differing chiefly in the points indicated in the key. In the specimen from Douglas County noted below, the central area of the triangle is paler, almost yellowish, leaving a broad reddish stripe on each side of the triangle, and the palpi are yellowish. The author at first placed this as a distinct species, but the slightly teneral condition of the specimen, and the later discovery of intermediate specimens, convinced him that it was *laticornis*.

Distribution:—1, Douglas County, (F. H. Snow); 1, Gove County; 1, Hodgeman County, July 17–25, 1917; 1, Sheridan County, (F. X. Williams); 1 each from Hamilton and Morton Counties, determined by Aldrich as *laticornis*, [all Snow Colln.]. 1, Ottawa County, June 24, 1934, (R. H. Painter); 2, Riley County, May 26 and June 4, (R. H. Painter; swept from wheat), [all K.S.C.]. 1, McPherson County, June 30, 1934, (C. W. Sabrosky); 1, Riley County, July 20, (R. H. Painter); 1, Riley County, May 16, 1934, (C. W. Sabrosky); 16, Saline County, June 7, 1933, (C. W. Sabrosky; sweeping vegetation along a small stream); 1, Stafford County, June 30, 1934, (C. W. Sabrosky), [all A.N.S.P., and C.W.S.]. May 16–July 20.

31. **Ectecephala albistylum** Macquart

1850. *Ectecephala albistylum* Macquart, Dipt. Exot., Suppl., IV, (2), p. 280. [North America.]

The type species of the genus is apparently a fairly common species throughout Kansas. In the majority of specimens, the legs are almost entirely yellow or reddish, with dark fore tarsi, but many examples taken at Manhattan have much more black on the legs, especially on the femora.

Distribution:—Recorded by Tucker (1909) from Douglas County in June and July. Nearly one hundred specimens have been determined, from Bourbon, Clark, Decatur, Douglas, McPherson, Ottawa, Pottawatomie, Reno, Riley, Saline and Stafford Counties, [Snow Colln., K.S.C., A.N.S.P., Arkansas Univ., and C.W.S.]. It is frequently collected by sweeping vegetation along the banks of streams. April 28–October 8.

PARECTECEPHALA Becker

No specimens belonging to this genus have been found in the Kansas material studied by the author; however, a number of specimens of *Parectecephala eucera* (Loew) from Fayetteville, Arkansas, have been identified [Colln. University of Arkansas], and the species probably occurs in southeastern Kansas.

EUCHLOROPS Malloch (Phyllomyzidae?)

In the course of a revision of the species of Agromyzidae *sensu latu,* Malloch (1913) described two new species of Milichiinae, *vittata* and *similis,* in a new genus *Euchlorops.* Aldrich later recognized *similis* and a new species, *canadensis* Ald., as the European genus, *Lasiosina* Becker. The only good distinction here is that *Lasiosina* has only one pair of dorsocentral bristles, whereas *Euchlorops vittata* has four well-developed pairs. In Curran's recent manual of North American Diptera, however, *Lasiosina* was not included, and *Euchlorops* was placed in the family Phyllomyzidae.

Although the species have longer fronto-orbital and thoracic bristles than usual among Chloropidae, yet in most respects they agree closely with that family, and in many keys will run directly to it. The records have therefore been included here for completeness. In the key, the species would run to the Chloropinae, and may be recognized by the well-developed fronto-orbital and thoracic bristles, and the cross-veins of the wing not approximated. Pending further information, both *vittata* and *similis* are recorded as *Euchlorops.*

Euchlorops vittata Malloch

1913. *Euchlorops vittata* Malloch, U. S. Natl. Mus. Proc., XLVI, p. 139. [Kansas.]

This yellow, bristly species was described as having four pairs of dorsocentral bristles, but Kansas specimens have been seen with from two to seven pairs. It is rather common in sweepings on grasses, especially in the spring. The female holotype was collected at Wellington, Kansas, January, 1913, (H. E. Smith), hibernating in a clump of Little Bluestem, *Andropogon scoparius*.

Distribution:—2, Sumner and Sedgwick Counties, 1916, (R. H. Beamer), [Snow Colln.]. Several, McPherson County, July 1, 1934, (C. W. Sabrosky and R. H. Painter); 1, Meade County, July 23, 1933, (R. H. Painter); 1, Ottawa County, June 24, 1934, (C. W. Sabrosky); 1, Stafford County, June 30, 1934, (C. W. Sabrosky); 5, Riley County, June 30, (R. H. Painter); 1, Riley County, April 24, 1933, (D. R. Musser); 1, Riley County, May 10, (C. W. Sabrosky; swept from wheat); 6, Riley County, April 16, 1934, (C. W. Sabrosky; sweeping Indian grass, *Sorghastrum nutans*); 106, Riley County, 1930–1934, (D. A. Wilbur; swept from pasture grasses); [all K.S.C., A.N.S.P., and C.W.S.]. April 16–November 5.

Euchlorops similis Malloch

1913. *Euchlorops similis* Malloch, U. S. Natl. Mus. Proc., XLVI, p. 140. [New Mexico.]

1918. *Lasiosina similis* Aldrich, Canad. Ent., L, p. 336. (Gen. comb.)

Aldrich believed that this species belonged in the Chloropid genus *Lasiosina*. It is very similar to *vittata*, differing chiefly in the possession of only one pair of strong dorsocentral bristles. The separation of two such closely related forms as these may be unjustified, however, and the author prefers to record them under the original name, and leave the question of family status for the future.

Distribution:—1, Stafford County, June 30, 1934, (C. W. Sabrosky); 10, Riley County, 1930, (D. A. Wilbur; swept from pasture grasses); [all K.S.C. and C.W.S.]. June 30–August 23.

Subfamily OSCINELLINAE

HIPPELATES Loew

The exact status of the generic name has been the subject of considerable dispute in recent years. Various authors have used the name *Cadrema* Walker 1860, following the example of

Kertesz, who examined Walker's type of *Cadrema lonchopteroides* from the Celebes. Aldrich (1931) reported, however, that the type is headless, and he believed that the species was more likely to be congeneric with *Prohippelates pallidus* (Lw.).

Although various subdivisions have been suggested, the familiar name *Hippelates* is retained here in its broad sense, for the sake of convenience. The author believes that the separation of species with elongate proboscis (*nobilis, plebejus*, etc.) is a valid one, at least for subgeneric standing, and he has indicated such in the key. The presence of a hind tibial spur will distinguish the species of the whole group from all other Chloropidae in this region. The number of species seems to be fairly large, but a careful study of variation and taxonomic characters is badly needed.

The species of *Hippelates* are well-known in Kansas, as well as in the southern states and in the tropics, as the troublesome eye-gnats, which cluster around the face, ears, and hands. In some regions they are believed to be the vectors of eye diseases such as "pink-eye" or conjunctivitis, but in Kansas they are probably of slight importance, except as sources of considerable annoyance. Some of the species are known to breed in organic matter which is in an advanced stage of decomposition.

The author is indebted to Mr. David G. Hall of the Bureau of Entomology and Plant Quarantine for checking the identification of the species in the *pallipes-pusio* complex, including specimens of an undescribed species.

Key to the Species of Hippelates sens. lat. in Kansas

1. Mesothorax yellow, the notum vittate .....*Opetiophora straminea* Lw.
   Mesothorax black 2
2. Proboscis elongate, geniculate; mesonotum thickly gray dusted; large species (*Hippelates* sensu strictu) 3
   Proboscis not elongate, fleshy; mesonotum thinly pollinose or bare 4
3. Scutellum with reddish-yellow border; vertical triangle entirely gray dusted .....*plebejus* Lw.
   Scutellum entirely black, gray dusted; triangle usually with a shining black spot below the ocelli .....*nobilis* Lw.
4. Mesonotum wholly pollinose .....*texana* Mall.
   Mesonotum wholly or in part bare and shining 5

5. Mesonotum entirely bare, highly polished 6
   Mesonotum distinctly gray dusted on the posterior portion, the dusting extending anteriorly on the dorsocentral lines, so that the notum appears to have three shining black stripes on a gray pollinose ground. *subvittata* Mall.
6. Legs very pale yellow; mesonotum with few punctures, arranged in three to five rows, including the dorsocentral rows; in the males, the anterior half of the triangle is also pale yellow, sharply demarcated from the remainder of the triangle .....*pallipes* (Lw.)
   Not such flies .....*pusio* Lw.

32. **Opetiophora straminea** Loew

1872. *Opetiophora straminea* Loew, Berl. Ent. Zeit., XVI, p. 105. (Cent., X, no. 90.) [Texas.]

1898. *Hippelates stramineus* Coquillett, Jour. N. Y. Ent. Soc., VI, p. 44. (Gen. comb.)

This peculiar little species, originally described from Texas, is very unlike the other *Hippelates*, with reddish-brown stripes on a stout, pale yellow mesonotum, and a short, black, spine-like hind tibial spur. It differs markedly from all Chloropidae known to the author in the black, heavily sclerotized, spike-like ovipositor of the female. Malloch recently[9] called attention to this unique ovipositor, as well as to some other characters, and stated that he believed *Opetiophora* to be "valid at least for subgeneric rank". Some time ago, the author had arrived at nearly the same conclusion, after studying a rather considerable series from Kansas, and it is his belief that the concept is entitled to restoration to full generic rank. Although nothing is known of the life history of the species, the form of the ovipositor would lead one to believe that the early stages are passed under different conditions than is true of the other *Hippelates*.

Inasmuch as it will run to that genus in Curran's key, *straminea* is included here in the key to the species of *Hippelates*. A Kansas specimen was compared with the type at the Museum of Comparative Zoology by Mr. Bates.

Distribution:—1, Morton County, (Snow), determined by Aldrich; 3, Hamilton County, July, 1921; 1, Sedgwick County, 1916, (R. H. Beamer), [Snow Colln.]. 1, Ottawa County, June 24, 1934, (R. H. Painter; small sand dune area); large series, Ottawa County State Lake, June 23, 1934, (C. W. Sabrosky; sweeping marsh vegetation); Hutchinson, Reno County,

[9] Dipt. Pat. & S. Chile, VI, p. 403, (1934).

June 30, 1934, (C. W. Sabrosky; common on the flowers of *Helianthus* sp.); 1, Riley County, September 17, 1934, (H. Walkden; at trap light); 1, Riley County, June 9, 1934, (C. W. Sabrosky; sweeping slough grass); 1, Saline County, June 7, 1933, (C. W. Sabrosky); 1, Maize, Sedgwick County, June 29, 1934, (C. W. Sabrosky; swept from flowers of *Helianthus* sp.); several, Stafford County, June 30, 1934, (C. W. Sabrosky); [all A.N.S.P., K.S.C., and C.W.S.]. June 7–September 17.

33. **Hippelates plebejus** Loew

1863. *Hippelates plebejus* Loew, Berl. Ent. Zeit., VII, p. 36. (Cent., III, no. 68.) [District of Columbia.]

Plebejus, which was designated by Coquillett as the genotype, is a large, gray pruinose species, with the head yellow except for the short gray triangle, and the hind tibial spur very long and curved. It is fairly common in many localities in Kansas. A Kansas specimen was compared with the type at the Museum of Comparative Zoology by Mr. Bates.

Distribution:—Recorded from Onaga, Pottawatomie County, latter part of June, by Crevecoeur (1905), who found them crawling over cows, "being presumably attracted by the smell of fresh milk". 28 specimens, from Allen, Bourbon, Chautauqua, Cherokee, Crawford, Johnson, Labette, Miami, Montgomery, Pratt, and Sumner Counties, 1915–1916, (R. H. Beamer); 1, Douglas County, July 24, 1920, (Wm. E. Hoffmann); [all Snow Colln.]. 1, Ottawa County, April 30, 1933, (R. H. Painter); 2, Riley County, May 11, 1932, and June 30, (D. A. Wilbur); 1, Riley County, April 24, 1933, (D. R. Musser); 1, Riley County, May 16, 1934, (C. W. Sabrosky); 1, Riley County, April 9, (C. W. Sabrosky); 3, Riley County, April 23, 1934, (C. W. Sabrosky; on flowers of *Acer negundo*); a large series, including several pairs taken in coitu, box canyon on the Ellsworth County-Saline County line, April 30, 1934, (C. W. Sabrosky; both sexes common on the flowers of the Spring Beauty, *Claytonia virginica*); [all A.N.S.P., K.S.C., and C.W.S.]. April 9–July 24.

34. **Hippelates nobilis** Loew

1863. *Hippelates nobilis* Loew, Berl. Ent. Zeit., VII, p. 35. (Cent., III, no. 67.) [Illinois.]

Like *plebejus*, but with the lower half of the pleura glossy black, generally a shining black spot on the triangle below the ocelli, reddish-bordered scutellum, and definite black bands on the hind femora and hind tibiae. A Kansas specimen was compared with the type at the Museum of Comparative Zoology by Mr. Bates.

Distribution: — Not common in Kansas. 1, Douglas County, labeled *plebejus* in the collection; 3, Hamilton County, F. H. Snow); 1, Montgomery County, 1916, (R. H. Beamer), [all Snow Colln.]. 1, Riley County, July 19, 1930, (D. A. Wilbur), [K.S.C.]; 1, Ottawa County, June 24, 1934, (C. W. Sabrosky); 1, Pottawatomie County, June 5, 1934, (C. W. Sabrosky); 1, Riley County, May 13, 1933, (C. W. Sabrosky); 1, Stafford County, June 30, 1934, (C. W. Sabrosky); [all C.W.S.]. May 13–July 19.

35. **Hippelates texana** Malloch

1913. *Hippelates texana* Malloch, U. S. Natl. Mus. Proc., XLVI, p. 251. [Texas, Louisiana, Mexico.]

Although resembling *Oscinella coxendix* (Fitch), it may be distinguished by the short hind tibial spur, the black fore coxae, and the restricted extent of orange or yellow color on the anterior portion of the front. The spur is about equal in length to the diameter of the hind tibiae, and is often difficult to see on the black tibiae. Kansas specimens were checked by Mr. D. G. Hall.

Distribution:—1, Douglas County, August 23, (M. W. Sanderson); 302, Riley County, (D. A. Wilbur); sweeping pasture grasses); [all K.S.C., A.N.S.P., and C.W.S.]. April 18–October 26.

The species seems to be very common in the region about Manhattan, Kansas, but until the writer has had a chance to study certain variations noted in his material, further records will not be published.

36. **Hippelates subvittata** Malloch

1913. *Hippelates subvittata* Malloch, U. S. Natl. Mus. Proc., XLVI, p. 251. [Texas, Louisiana, District of Columbia.]

The vittate appearance noted in the key will serve to characterize the species; further, the face and frons darker than in most species, and the legs black, with the hind tibial spur short and difficult to see. The species appears to be common in southeastern Kansas, but less common elsewhere in the state. A Kansas specimen was compared with type in the U. S. National Museum by the late Dr. Aldrich.

Distribution:—1, Douglas County, 1914, (W. F. Brown; swept from alfalfa); 80 specimens, from Bourbon (4), Cherokee (58), Crawford (8), Kingman, Labette, Linn, Miami, Sedgwick, and Sumner Counties, 1915–1916, (R. H. Beamer); [all Snow Colln.]. 160, Riley County, 1930–1934, (D. A. Wilbur; sweeping pasture grasses); 1, Riley County, June 17, (W. A. Talbott, Jr.; on white sweet clover); 1, Riley County, October 7, 1929,

(T. F. Winburn); 1, Riley County, June 25, (F. Marlatt); [all K.S.C.]. 1, Douglas County, September 30, 1933, (H. M. Smith); 18, Douglas County, May 23 (7) and August 23 (11), 1934, (M. W. Sanderson); several, Ottawa County, April 30, 1933 and June 24, 1934, (C. W. Sabrosky and R. H. Painter); Stafford County, April 29 and June 30, 1934, (C. W. Sabrosky); Riley County, May 28 and June 22, 1932, and May 2, 1934, (C. W. Sabrosky; very numerous, sweeping in a swale covered with slough grass); [all A.N.S.P., and C.W.S.]. April 29–October 24.

37. **Hippelates pallipes** (Loew)

1863. *Oscinis pallipes* Loew, Berl. Ent. Zeit., VII, p. 37. (Cent., III, no. 69.) [Cuba.]

1912. *Hippelates pallipes* Becker, Ann. Mus. Nat. Hung., X, p. 88. (Chloropidae IV.) (Syn. of *H. flavipes* Lw., 1865.)

1913. *Hippelates pallipes* Aldrich, Ent. Soc. Wash. Proc., XXXIII, p. 70.

This is a striking species with its shining black body and pale yellow legs. In the female, the front is narrowly yellow along the anterior margin, and the triangle is almost entirely black; in the male, on the other hand, the yellow forms a broad anterior area, distinctly marked off from the black posterior portion of the front, and including the apical third of the triangle. Becker described this form as a distinct species (*partitus*), but Malloch (1934, p. 410) recently noted that it was really the male of the common *pallipes* (Lw.). Loew himself included males like *partitus* in his type series of the synonymous *flavipes* (noted by Aldrich, 1931; male cotype examined by the author), although he did not mention it in his description.

In view of the similar habits of many other dipterous pests of animals, such as the Tabanidae, it is interesting to note that the *Hippelates* flies found on humans and farm animals are almost all females, whereas the males, from the author's observations, are flower frequenters. On April 16, 1934, near Manhattan, Kansas, the males were found to be very common on the blossoms of *Prunus americana*. Very few females were present. Later, on April 23, the species was found to be present in considerable numbers on the flowers of *Acer negundo*. Two or three sweeps yielded about 65 *pallipes*, of which over 40 were males. Two days later, on April 25, a number of males were collected on the flowers of *Lepidium draba*. Both sexes were taken on June 11 on carrot flowers. Robertson, in his work on

"Flowers and Insects" (1928), recorded *flavipes* Lw. from nine species of flowers, all belonging to the Umbelliferae.

The species was recorded from Kansas by Aldrich (1905, Catalogue) as *Oscinis pallipes*, "found in abundance attending the horn fly on cattle at Lawrence, Kansas". Tucker (1907a, b) also recorded it from Douglas County, and from Sedgwick County, as *H. flavipes* [Snow Colln., verified by the author].

Distribution:—Several hundred pinned specimens have been identified, from Allen, Bourbon, Butler, Cherokee, Crawford, Douglas, Harper, Johnson, Kearney, Labette, Linn, McPherson, Miami, Montgomery, Neosho, Pottawatomie, Pratt, Reno, Riley, Saline, and Sedgwick Counties; [all Snow Colln., K.S.C., A.N.S.P., and C.W.S.]. April 14–October 24.

38. **Hippelates pusio** Loew

1872. *Hippelates pusio* Loew, Berl. Ent. Zeit., XVI, p. 103. (Cent., X, no. 87.) [Texas.]

Like *pallipes*, this is a shining black species, but the femora are more or less black, and the polish of the mesonotum is slightly dulled because of the numerous punctures. For the present paper, this is not distinguished in the key from a closely related new species, which will be described by Mr. Hall.[10]

There is great disagreement among Dipterists as to what *pusio* really is, and until this problem can be worked out, and until the long series of specimens has been studied in some detail and compared with material at Washington, the locality records will not be given. Specimens from Manhattan, Kansas, submitted to Mr. Hall, were identified by him as *Hippelates pusio*.

CRASSISETA Von Röser

The genus *Crassiseta*, in the sense of Curran and others, includes certain species with a more or less distinctly flattened and densely haired antennal arista, and it includes the species with plain scutellum (*longula*, etc.) as well as those in which

[10] The writer was informed by Mr. D. G. Hall that he had described a new species of *Hippelates*, based on material collected at Manhattan, Kansas, by Dr. F. C. Bishopp. Mr. Hall identified several specimens from the Sand Dunes, Medora, Reno County, and from Saline County, as belonging to the new species. Since the description is still in manuscript form, the name and records will not be published at this time.

the scutellum bears distinct setigerous tubercles. The species which lacked the scutellar tubercles were separated by Bezzi as the genus *Melanochaeta*, and this division was accepted by Becker in his monographs of the family. Perhaps this should be considered only as of subgeneric rank; at any rate, the North American species fall readily into two groups based on the above character, and the concept will therefore be useful for this fauna.

Key to the Species of Crassiseta in Kansas

1. Scutellum with distinct marginal setigerous tubercles (*Crassiseta* sensu strictu) 2
   Scutellum rounded, without tubercles (subgenus *Melanochaeta*) 3
2. Head, except the antennae, black; scutellum with two to four small tubercles ..... *nigriceps* Lw.
   Head, especially the front and face, more or less yellow to reddish; scutellum with four to six large tubercles ..... *costata* Lw.
3. Mesonotum black 4
   Mesonotum obscure orange, with three black stripes on the dorsum; arista very broad ..... *eunota* Lw.
4. Vertical triangle shining black 5
   Vertical triangle and mesonotum dull gray ..... *longula* Lw.
5. Antennae entirely black ..... *nigricornis* Lw.
   Antennae orange, basal joints brown above ..... *decipiens* (Lw.)

39. **Crassiseta nigriceps** Loew

1863. *Crassiseta nigriceps* Loew, Berl. Ent. Zeit., VII, p. 33. (Cent., III, no. 63.) [Pennsylvania.]

The color of the head, presence of considerable black on the legs, and the small tubercles on the scutellum will serve to distinguish this shining black species from the following one, which it closely resembles. A Kansas specimen was compared with the type at the Museum of Comparative Zoology by Mr. Bates.

From the very early spring collecting records, it was inferred that this species overwintered in the adult stage, and the inference is borne out by the fact that two specimens were collected in hibernation near Manhattan, Riley County, January 26, 1929, by R. H. Painter and D. A. Wilbur. Adults are frequently taken in sweepings in the spring on young wheat and volunteer wheat, and later the flies sometimes appear in cages containing wheat plants. The exact feeding habits of the larvae are not known,

but from the published records, it is possible that they feed on decaying parts of the plants, following injury by other insects.

Distribution: — A large series has been determined, from Cherokee, Douglas, McPherson, Miami, Ottawa, Riley, and Sedgwick Counties; [all Snow Colln., A.N.S.P., K.S.C., and C.W.S.]. March 20–October 17.

40. **Crassiseta costata** Loew

1863. *Crassiseta costata* Loew, Berl. Ent. Zeit., VII, p. 33. (Cent., III, no. 62.) [District of Columbia.]

Typical specimens of *costata* have a shining black pleura; however, a variety with reddish pleura is occasionally found. One interesting aberration (Riley County, April 16, R. H. Painter Collector) was found, in which there were seven scutellar bristles on tubercles, the odd one being at the apex of the scutellum, between the apical pair of tubercles. A typical Kansas specimen was compared with the type at the Museum of Comparative Zoology by Mr. Bates.

Costata is a fairly common species in Kansas, especially in spring sweepings on wheat and volunteer wheat. Like the related *nigriceps*, it appears to overwinter as an adult, from the evidence of early collecting records, and from the fact that three adults were collected in hibernation in old leaves and rubbish at Manhattan, Kansas, February 18 and 20, 1933 by Fred Kruger and D. R. Musser.

Distribution:—Recorded by Snow (1903) from Douglas County, and by Tucker (1907b) from Douglas and Sedgwick Counties, [Snow Colln., records verified]. Over 100 specimens were identified, from Douglas, McPherson, Miami, Ottawa, Pottawatomie, Riley, Saline, and Smith Counties; [all Snow Colln., K.S.C., A.N.S.P., and C.W.S.]. Specimens were taken on the flowers of *Prunus americana,* April 18, 1934, (C. W. Sabrosky). April 2–October 24.

Three specimens, Riley County, April 2 and 9, and October 8, 1932, (C. W. Sabrosky), [C.W.S.], show the reddish pleura.

41. **Crassiseta (Melanochaeta) eunota** Loew

1872. *Crassiseta eunota* Loew, Berl. Ent. Zeit., XVI, p. 104. (Cent., X, no. 89.) [Texas.]

1912. *Melanochaeta eunota* Becker, Ann. Mus. Nat. Hung., X, p. 82. (Chloropidae, IV.) (Gen. comb.)

The orange ground color will separate the species at once from others of the group. The triangle is shining black, the

antennae are black, and the legs are typically orange, with the fore tibiae and all tarsi black. A Kansas specimen was compared with the type at the Museum of Comparative Zoology by Mr. Bates.

Distribution:—2, Douglas County, (F. H. Snow); 1, Sedgwick County, 1916, (R. H. Beamer); 3, Sumner County, 1916, (R. H. Beamer); [all Snow Colln.]. 11, Riley County, June 6, 18, July 10, and September 15, 1930, (D. A. Wilbur; sweeping pasture grasses); large series, Ottawa County, June 24, 1934, (C. W. Sabrosky and R. H. Painter; sweeping marsh vegetation); [all A.N.S.P., K.S.C., and C.W.S.]. June 6–September 15.

42. **Crassiseta (Melanochaeta) longula** Loew

1863. *Crassiseta longula* Loew, Berl. Ent. Zeit., VII, p. 34. (Cent., III, no. 64.) [District of Columbia.]

1912. *Melanochaeta longula* Becker, Ann. Mus. Nat. Hung., X, p. 83. (Chloropidae, IV.) (Gen. comb.)

The gray, lead-colored appearance of this common species is quite distinctive in this group, and will aid in quick recognition. Furthermore, the antennal arista is not as strongly developed as in the other species. A Kansas specimen was compared with the type at the Museum of Comparative Zoology by Mr. Bates.

Distribution:—Recorded from Douglas County by Snow (1903), and from Sedgwick County by Tucker (1907b), [Snow Colln.; records verified]. About 150 specimens were identified, from Crawford, Douglas, Marshall, Miami, Ottawa, Pottawatomie, Riley, Saline, Sedgwick, Sheridan, and Sumner Counties; [all Snow Colln., A.N.S.P., K.S.C., and C.W.S.]. April 2–October 24.

Longula is common in sweepings on wheat, and frequently emerges in cages containing volunteer wheat. At Manhattan, Kansas, it was reared on June 24, 1933, by Professor D. A. Wilbur, from a number of puparia collected on June 19 in the decaying stem of a large sedge.

43. **Crassiseta (Melanochaeta) nigricornis** Loew

1863. *Crassiseta nigricornis* Loew, Berl. Ent. Zeit., VII, p. 34. (Cent., III, no. 65.) [Louisiana.]

1912. *Melanchaeta nigricornis* Becker, Chloropidae, IV, p. 83. (Gen. comb.)

This species is rather small and shining black, with black antennae, broad black arista, and almost entirely pale yellow legs. It is further characterized by one pair of fronto-orbital bristles being very long and prominent, and equal in length to

the outer vertical bristles, a character which has not hitherto been noted in the literature.

Distribution:—1, Douglas County, July 24, 1920, (Wm. E. Hoffmann); 1, Wichita County, [Snow Colln.]. 101, Riley County, 1930–1934, (D. A. Wilbur; sweeping pasture grasses); 10, Douglas County, May 23 and August 23, 1934, (M. W. Sanderson); several, McPherson County, July 1, 1934, (C. W. Sabrosky and R. H. Painter); 2, Ottawa County, June 24, 1934, (C. W. Sabrosky and R. H. Painter); 2, Riley County, June 26 and September 27, 1934, (C. W. Sabrosky); 1, Riley County, October 4, 1933, (C. W. Sabrosky; emerged from volunteer wheat); [all K.S.C., A.N.S.P., and C.W.S.]. May 13–October 24.

Crassiseta (Melanochaeta) decipiens Loew

1863. *Oscinis decipiens* Loew, Berl. Ent. Zeit., VII, p. 40. (Cent., III, no. 76.) [Alaska.]

1912. *Melanochaeta decipiens* Becker, Ann. Mus. Nat. Hung., X, 84. Chloropidae, IV.) (Gen. comb.)

The writer has not seen this species, and it is included here solely from the description. It was recorded from Douglas County, July, by Tucker (1907a, b), but his specimen has been lost from the pin and the record cannot be checked.

GAURAX Loew and PSEUDOGAURAX Malloch

No representatives of these genera have thus far been found in Kansas. The known records indicate that the larvae are probably scavengers, as the species have been bred from the spider egg sacs, from a cluster of egg shells of *Corydalus*, and from the cocoons of various moths, such as the white-marked tussock moth and the cecropia moth. Several species have been described and recorded from Illinois, and it is possible that with extensive rearing and better knowledge of the Acalyptrate fauna, some of the species may be recorded from Kansas.

CHAETOCHLOROPS Malloch

Chaetochlorops inquilina (Coq.) [*Siphonella inquilina* Coquillett, 1898a, p. 48] was described from Virginia and Missouri. It is not known from Kansas, but the author has seen one specimen from Fayetteville, Arkansas, and the species is likely to occur in southeastern Kansas. It is the only described species in the genus, and is easily identified by the generic key.

DICRAEUS Loew

The genus *Dicraeus* is noteworthy in that it is an exception to the long-standing division of the family into two subfamilies based on the extent of the costal vein. Although located at first in the Chloropinae, it is generally accepted as belonging in the Oscinellinae, close to *Oscinella.* The principal generic character, which Curran employs in his key, is the unusually long second vein, with the result that the second costal sector is three or four times the length of the third sector.

44. **Dicraeus incongruus** Aldrich

1918. *Dicraeus incongruus* Aldrich, Canad. Ent., L, p. 339. [Utah, Idaho, Montana, Manitoba.]

The wing venation of this species corresponds to the figure in Curran's manual. It is a subshining species, with large, subshining, poorly defined triangle, broad and dull yellow cheeks, shining black pleura, and almost entirely black legs. Kansas specimens have darker antennae, face, and cheeks, but otherwise agree closely with the description. It is apparently a western species, judging by the published records.

Distribution:—5, Riley County, May 18, (Popenoe); 1, Riley County, May 26, 1930, (R. C. Smith; swept from alfalfa); 9, Riley County, June 6, 1930 (8) and May 18, 1932, (D. A. Wilbur; sweeping pasture grasses); [all K.S.C.]. 1, Riley County, May 9, 1933, (D. R. Musser); 2, Riley County, May 13, 1933, (C. W. Sabrosky); 20, Riley County, June 4, 1933, (C. W. Sabrosky; all swept from *Elymus virginicus*); [all A.N.S.P. and C.W.S.]. May 9–June 6.

MADIZA Fallen (= Siphonella Macq.)

The genus *Madiza* is distinguished by an elongate, geniculate proboscis, margin of the mouth somewhat produced, and the eyes usually short pubescent. Although in the genus as a whole, there is a wide range and a gradation towards related genera, the Kansas species as a rule are quite easy to place. *Hippelates plebejus* and *H. nobilis* may be confused with *Madiza* in general appearance and in the form of the proboscis, but the presence of the large hind tibial spur will serve to differentiate them. Twelve species of the genus are here recorded from Kansas.

The species of *Madiza* whose habits have been observed by the author seem to frequent flowers, and probably feed on plant

secretions. The form of the proboscis would also lead to this conclusion. *Madiza cinerea* (Lw.) was the second species in abundance in Professor Wilbur's sweepings on pasture grasses at Manhattan, Kansas, with 1,951 specimens out of the total of 11,233, but the other species are comparatively uncommon.

Key to the Species of Madiza in Kansas

1. Mesonotum black, gray to brownish-gray pollinose 2
   Mesonotum black, not pollinose, more or less shining 7
   Mesonotum with yellow ground color 9
2. Mesonotum vittate 3
   Mesonotum not vittate 4
3. Mesonotum with three broad brown vittae .....*trivittata* Sabrosky
   Mesonotum with four pale brown vittae .....*quadrivittata* Sabrosky
   Mesonotum with five narrow brown vittae .....*quinquelineata* (Ad.)
4. Third antennal segment orange, sometimes fuscous at the apex; legs predominantly yellow 5
   Third antennal segment entirely black; vertical triangle short, and the front very broad; legs black, knees of the fore legs orange; 2.5 mm. *latifrons* (Lw.)
5. Pleura black, entirely or partly pollinose 6
   Pleura orange to brown, with poorly defined black spots; 1.25 to 1.5 mm. *triangulata* (Beck.) var.
6. Large species (3 mm.); antennae and aristae yellow ..*provocans* (Beck).
   Small species (1.5 mm.); antennae yellow, fuscous at tip ..*cinerea* (Lw.)
7. Intrahumeral bristles present .....*setulosa* Mall.
   Intrahumeral bristles absent 8
8. Mesonotum thickly and finely punctate, with no trace of lines of punctures; vibrissal angle produced anteriorly as far as the antennae; scutellum as long as broad; proboscis very long and slender; large species (2–3 mm.) .....*oscinina* (Fall.)
   Mesonotum punctate, the punctures arranged in rows; vibrissal angle of the mouth not greatly produced; scutellum shorter than broad at base; proboscis only moderately elongated; small species (1.5 mm.). *nigripalpis* Mall.
9. Mesonotum with three dark gray longitudinal stripes; antennae yellow, the third segment light brown on the upper margin; vertical triangle with a large, shining black spot just below the ocelli. *punctifrons* (Beck.)
   Mesonotum with four short, yellow vittae on the reddish-gray disk; triangle yellow with dull black ocellar spot ...*submarginalis* Sabrosky

Madiza abdominalis (Beck.), described from Onaga, Kansas, has been transferred to *Oscinella*. See notes under *O. abdominalis* (Beck.).

45. **Madiza trivittata** Sabrosky

1935. *Madiza trivittata* Sabrosky, Jour. Kans. Ent. Soc., VIII, p. 109. [Kansas, New Jersey, New York, South Carolina, Texas.]

In his study of the species of *Siphonella*, Adams (1904, p. 104) recorded one specimen from Colorado of a species with three brown vittae, which he identified and included in his key as *Siphonella trilineata* (Meigen). Becker (1912, p. 95) pointed out, however, that the European species (recently placed by Duda in a new genus, *Aphanotrigonum*) had a short proboscis and did not belong in *Siphonella*, but in *Notonaulax* Beck., now called *Tricimba* Lioy. The North American species identified by Adams as *trilineata* was unknown to Becker.

Several specimens, which are undoubtedly conspecific with the lone specimen seen by Adams, have recently been described by the author as *trivittata*, equivalent to *trilineata* Adams nec Meigen. It is close to *quinquelineata* Adams, from which it differs notably in the presence of only three vittae, consistently larger body size, and very elongate proboscis.

Distribution:—2♂, 6♀ (including the *type* male and the *allotype*), Riley County, June 30, August 13, Sept. 13, October 1, 3, 8, and 24, 1930, (D. A. Wilbur; sweeping pasture grasses), [K.S.C. and C.W.S.]. 1♂, Riley County, October 17, 1933, (C. W. Sabrosky; swept from *Sporobolus asper*); 1♂, Riley County, September 17, 1933, (C. W. Sabrosky; on flowers of the Madeira Vine *Boussingaultia*); 1♂, 2♀, Pottawatomie County, September 27, 1933, (C. W. Sabrosky); 1♀, Douglas County, October 11, 1933, (H. M. Smith); 1♂, Ottawa County, June 23, 1934, (C. W. Sabrosky); [all C.W.S. and A.N.S.P.]. June 23–October 24.

46. **Madiza quadrivittata** Sabrosky

1935. *Madiza quadrivittata* Sabrosky, Jour. Kans. Ent. Soc., VIII, p. 108. [Kansas, New Jersey.]

Four distinct, brown-pollinose vittae on the mesonotum distinguish this species at once from other related species. The type specimen, a male, was collected by the author at Manhattan, in Riley County, September 27, 1934 [C.W.S.]. Several other specimens, from New Jersey, were found in the Cornell University Collection.

47. **Madiza quinquelineata** (Adams)

1904. *Siphonella quinquelineata* Adams, Psyche, XI, p. 104. [Louisiana, Georgia.]

A small (1.7 mm.), dark gray pollinose species; the five stripes are narrow but usually distinct, the lateral vittae rather short; legs mostly black.

Distribution:—1, Riley County, May 8, (C. W. Sabrosky); 1, Ottawa County, June 24, 1934, (C. W. Sabrosky); 12, Riley County, June 6, 18, and 30, 1930, (D. A. Wilbur; sweeping pasture grasses); [all K. S. C., A.N.S.P., and C.W.S.]. May 8–June 30.

48. **Madiza latifrons** (Loew)

1872. *Siphonella latifrons* Loew, Berl. Ent. Zeit., XVI, p. 106. (Cent. X, no. 91.) [Texas.]

The characteristically broad appearance of this species is due chiefly to the combination of a wide front and a short triangle with a broad base. A Kansas specimen was compared with type at the Museum of Comparative Zoology by Mr. Bates.

Distribution:—2, Douglas County, (F. H. Snow); 1, Jewell County, July 10, 1925, (H. Deay); 1, Lyon County, June 15, (R. H. Beamer); 2, Republic County, July 11, 1925, (H. Deay); 28, from Allen, Chautauqua, Cherokee, Cowley, Harper, Kingman, Linn, Miami, Montgomery, and Neosho Counties, 1915–1916, (R. H. Beamer); [all Snow Colln.]. 1, Mitchell County, September 6, (E. M. Painter); 1, Meade County, July 23, 1933, (R. H. Painter); [all K.S.C.]. 3, Riley County, August 23, September 13 and 24, 1930, (D. A. Wilbur); 1, Pottawatomie County, June 5, 1932, (C. W. Sabrosky); [all C.W.S.]. June 5–September 24.

49. **Madiza triangulata** (Becker)

1912. *Siphonella triangulata* Becker, Ann. Mus. Nat. Hung., X, p. 102. (Chloropidae, IV.) [Washington.]

Becker's description is very brief, and although the present series agrees fairly well with it, yet one cannot be certain whether the differences are only varietal or really represent a new species. In the characteristic features of a reddish-brown pleura with obscure black spots, dark pollinose mesonotum with short black hairs, and pollinose triangle, the series agrees with the description; the chief difference is that the legs are more extensively infuscated, and in extreme cases, they are entirely black except at the knees.

Of the 130 individuals of the species collected at Manhattan, Kansas, 1933-1934, 123 were swept from a Kentucky Blue Grass pasture. It is not known whether the fact is a mere coincidence or whether it indicates a significant host preference.

Distribution:—130, Riley County, 1933–1934, (D. A. Wilbur; sweeping pasture grasses), [K.S.C., C.W.S.]. April 27–October 18.

50. **Madiza provocans** (Becker)

1912. *Siphonella provocans* Becker, Ann. Mus. Nat. Hung., x, p. 98. (Chloropidae, iv.) [Massachusetts, Wisconsin.]

The description of *provocans* is very close to that of *cinerea* (Lw.), the chief difference being in size.

Distribution: — 6, Bourbon, Cowley, Miami, and Montgomery (3) Counties, 1915-1916, (R. H. Beamer), [Snow Colln.]. 3, Saline County, June 7, 1933, (C. W. Sabrosky), [C.W.S.] Four specimens from Lyon County, June 15, (R. H. Beamer), also appear to belong to this species.

51. **Madiza cinerea** (Loew)

1863. *Siphonella cinerea* Loew, Berl. Ent. Zeit., vii, p. 43. (Cent., iii, no. 81.) [Florida.]

This small, gray species is one of the commonest species of Chloropidae in general collecting in Kansas. It is somewhat variable in the extent of color on the abdomen and legs, and the mesonotum occasionally shows indistinctly punctured lines. A Kansas specimen was compared with the type at the Museum of Comparative Zoology by Mr. Bates.

As already indicated in the general discussion of *Madiza*, *cinerea* ranked second in abundance in the extensive sweepings on pasture grasses near Manhattan in Riley County, and it is also quite numerous in sweepings on wheat and alfalfa. Individuals are found commonly in many kinds of flowers, and the author has recorded them on the flowers of *Helianthus* spp., *Solidago* spp., several unidentified asters, *Eupatorium* sp., *Prunus virginiana*, white sweet clover, carrot, and elderberry, besides various unidentified species of Compositae. They are often extremely abundant on the flowers of the garden hollyhock (*Althaea rosea*) and the introduced Madeira vine (*Boussingaultia*). One specimen was taken by the author in Pottawatomie County, May 20, caught on the sticky stem of a large *Pentstemon* species, just below the flower.

The summary of the pasture insect data by Wilbur and Sabrosky [11] indicates that this species has three generations a year in Kansas; a spring generation, whose curve of abundance (judged by collections) starts somewhat later and continues longer than is true of other Chloropids; a large midsummer generation; and a smaller, more prolonged, and irregular fall generation, which may also overlap and include a partial fourth generation.

Distribution:—Apparently common throughout the state. Recorded by Snow (1903) from Morton County, [Snow Colln., record verified]. In addition to the large number collected by Professor Wilbur, several hundred specimens have been determined, from Bourbon, Butler, Cherokee, Clay, Douglas, Ellsworth, Harvey, Hodgeman, Kearney, Lane, Linn, McPherson, Meade, Miami, Morton, Ottawa, Pottawatomie, Reno, Republic, Riley, Saline, Sedgwick, Stafford, Sumner, and Wichita Counties; [all Snow Colln., A.N.S.P., K.S.C., and C.W.S.]. April 21–November 7.

52. **Madiza setulosa** Malloch

1918. *Madiza setulosa* Malloch, Bul. Brooklyn Ent. Soc., XIII, p. 110. [Illinois.]

Setulosa is a glossy black species, in which the mesonotum is densely punctured, with at least three definite lines of punctures, those in the dorsocentral rows rather deep; the femora, and broad median bands on the fore and mid tibiae, black. It is close to *neglecta* (Beck.) and *aequa* (Beck.), but is distinguished by the presence of two stout bristles on the anterior dorsal margin of the thorax, between the humeri. Kansas specimens were compared by the writer with the type in the collection of the Illinois State Natural History Survey.

Distribution:—1, Johnson County, 1915, (R. H. Beamer); 2, Miami County, 1915, (R. H. Beamer); 1, Douglas County, August 24, 1920, (Wm. E. Hoffmann); [all Snow Colln.]. 1, Riley County, May 29, 1930, (R. C. Smith; on white sweet clover); 1, Riley County, August 19, (W. A. Talbott, Jr.; on white sweet clover); 1, Riley County, (W. A. Talbott, Jr.; on vetch); 6, Riley County, July 31, 1933, (W. V. Redding; on alfalfa); 6, Riley County, May 26 and 28, 1930, (R. C. Smith; on alfalfa); [all K.S.C.]. 20, Riley County, June 18–October 8, 1930, (D. A. Wilbur; sweeping pasture grasses); several, Riley County, September 27, 1933, (C. W. Sabrosky; on flowers of an unidentified aster); [all K.S.C., A.N.S.P., and C.W.S.]. May 26–October 8.

[11] See footnote 2.

53. **Madiza oscinina** Fallen

1820. *Madiza oscinina* Fallen, Dipt. Suec., Oscinides, p. 9.
1910. *Siphonella oscinina* Becker, Arch. Zool., I, p. 141. (Chloropidae, I.)

A lone specimen from the southeastern corner of the state seems to belong to this European species. The published records indicate an eastern distribution in the United States. The original description has not been seen, but the specimen agrees well with Becker's redescription of the species in his work on the palaearctic fauna.

Distribution:—1, Crawford County, 1915, (R. H. Beamer), [Snow Colln.]

54. **Madiza nigripalpis** Malloch

1913. *Madiza nigripalpis* Malloch, Canad. Ent., XLV, p. 282. [Maryland.]

Nigripalpis belongs to the group of *Madiza* species which are shining black and not pollinose. It is almost entirely black or very dark brown, only the base of the third antennal segment, the knees, fore tibiae entirely, the apical third or fourth of the mid and hind tibiae, and all tarsi, yellow. The mesonotum is rather closely punctured, the punctures arranged in rows. In the specimen from Cowley County, the cheeks are much narrower than in the others of the series, and the anterior margin of the front is reddish-brown.

Distribution:—2, Leoti, Wichita County; 1, Cowley County, 1916, (R. H. Beamer); [Snow Colln.]. 2, Riley County, June 7, 1930, and May 21, 1934, (D. A. Wilbur), [C.W.S.].

55. **Madiza punctifrons** (Becker)

1912. *Siphonella punctifrons* Becker, Ann. Mus. Nat. Hung., X, p. 101. (Chloropidae, IV.) [Utah, Idaho.]

This is one of the few species of *Madiza* with yellow ground color, and it is further distinguished by the striking feature of a shining black, circular spot on the dull yellow vertical triangle, just below the ocellar tubercle.

The author at first believed that Kansas specimens represented a new species or variety closely related to *punctifrons*. Recently, however, the examination of a series of specimens from widely scattered localities throughout the West has shown that Becker's species is highly variable, and that the Kansas specimens are extreme, pale reddish forms. For example, the original description stated that the pleura are "yellow with four

dark brown spots", but in the Kansas material only the mesopleural spot is evident, the others being indistinct though still discernible. Many intermediate conditions, with varying combinations of the extent and intensity of color of the mesonotal vittae and the number of distinct spots on the pleura, were found in the material examined.

Distribution:—1♂, McPherson County, June 30, 1934, (C. W. Sabrosky); 1♀, Ottawa County, June 24, 1934, (C. W. Sabrosky); 2♂, 2♀, Reno County, June 30, 1934, (C. W. Sabrosky); 1♀, Riley County, September 16, 1933, (C. W. Sabrosky; on flowers of the Madeira Vine, *Boussingaultia*); [all C.W.S.]. June 24–September 16.

56. **Madiza submarginalis** Sabrosky

1935. *Madiza submarginalis* Sabrosky, Jour. Kans. Ent. Soc., VIII, p. 111. [Kansas, Mississippi, South Dakota.]

In general appearance, except for the elongate proboscis and a few other points, the species resembles *Oscinella marginalis* (Mall.). It is quite distinct from the known species of *Madiza*. The description was based on a series of five specimens, of which the type (male) was collected near Manhattan, Riley County, Kansas, June 12, 1934, (D. A. Wilbur; sweeping bluegrass), [C.W.S.].

TRICIMBA Lioy

The Kansas species of *Tricimba* are quite similar to certain species of *Madiza*, but they differ in having a shorter, fleshy proboscis and three distinctly deepened grooves on the mesonotum.

Key to the Species of Tricimba in Kansas

1. Four yellow, spine-like bristles, projecting like rays from the scutellum, and each situated on a small black tubercle, slightly ventrad of the margin ..... *lineella* (Fall.)
   Scutellum of the usual form, with two converging apical bristles. *brunnicollis* (Beck.)

57. **Tricimba brunnicollis** (Becker)

1912. *Notonaulax brunnicollis* Becker, Ann. Mus. Nat. Hung., X, p. 103. (Chloropidae, IV.) [Washington.]

A dull, brownish gray dusted species, with shining black pleura, except for the gray mesopleura and pteropleura. A Kansas specimen, which was compared with the type in the

U. S. National Museum by Mr. C. T. Greene, was found to differ only in minor points, chiefly in having shallower sulci on the mesonotum, and a somewhat darker front.

Distribution:—3, Douglas County, (R. H. Beamer); 2, Douglas County, (F. H. Snow); 1, Johnson County, 1916, (R. H. Beamer); 1, Miami County, 1915, (R. H. Beamer); [all Snow Colln.]. 1, Riley County, May 12, 1932, (H. M. Smith); 1, Riley County, June 16, 1930, (R. H. Painter; swept from wheat); [all K.S.C.]. 3, Riley County, June 18 and 30, and October 24, 1930, (D. A. Wilbur); 1, Riley County, October 24, 1932, (C. W. Sabrosky); 1, Riley County, September 15, 1933, (C. W. Sabrosky); on flowers of *Solidago* sp.); 1, Douglas County, October 4, 1933, (H. M. Smith); 1, Riley County, May 8, 1932, (C. W. Sabrosky); [all C.W.S.]. May 8–October 24.

58. **Tricimba lineella** (Fallen)

1820. *Oscinis lineella* Fallen, Dipt. Suec., Oscinides, p. 8.
1913. *Tricimba spinigera* Malloch, Ins. Insc. Mens., I, p. 60. [District of Columbia, Maryland].
1934. *Tricimba lineella* Malloch, Dip. Pat. & So. Chile, VI, p. 426.

The author has not seen European material of *lineella*, and the species is recorded as such in this paper on the authority of Malloch, who recognized his species as the European *lineella*. A Kansas specimen was compared with the type of *spinigera* at the U. S. National Museum by Mr. C. T. Greene.

The conspicuous features of the species are the three very deep, black, punctate grooves on the gray-pollinose mesonotum, and the presence of four bright yellow, spine-like bristles, each on a small black tubercle, slightly ventrad of the margin of the scutellum. These are evenly spaced, and appear like rays, with the apical pair pointing posteriorly, very slightly laterad from the median line, and each lateral bristle projecting postero-laterad at a 45° angle. The scutellum itself is dark brown, the surface warty in appearance. The color of the legs is quite variable, although the fore and mid tibiae, and the tarsi except for the distal segment, are almost always yellow.

Distribution:—3, Riley County, September 27, 1933, (C. W. Sabrosky; on the flowers of an undetermined species of aster), [C.W.S.]. A specimen has also been seen from Cameron County, Texas, August 3, 1928, (R. H. Beamer), [Snow Colln.].

OSCINELLA Becker

(*Oscinis* auctt., *Oscinosoma* Lioy, *Botanobia* Lioy)

The genus *Oscinella*, one of the largest in the family, is composed of rather small flies, seldom over 1.5 to 2 mm. long, and generally black, with some yellow markings, either with or without dusting; proboscis short, fleshy; arista bare or only short pubescent. A number of the species, such as the well-known frit-fly, have been reared from grains and wild grasses.

Opinion is greatly divided on the correct name for the genus. The details of the dispute are beside the point of the present paper, and the group will be referred to here as *Oscinella*, the name proposed by Becker.

Identification of the species in this genus is rather difficult, and it is very possible that a limited key to the species recorded here from Kansas is of little value. Many closely related species may be found in Kansas, in which case the limited key might be very misleading. Until it is possible to review the entire genus, however, the author does not care to attempt more than the brief, artificial key presented below.

Key to the Species of Oscinella in Kansas

1. Thorax of black ground color 2
   Thorax of yellow ground color 12
2. Mesonotum entirely or chiefly shining black 3
   Mesonotum more or less pollinose 7
3. Abdomen entirely pale yellow ..... *abdominalis* (Beck.)
   Abdomen shining brown to black, at least on the dorsum 4
4. Legs entirely pale yellow, at most the tarsi brown; antennae black. *umbrosa* (Lw.)
   Legs with some black markings; if legs are predominantly yellow, the antennae are yellow, at least in part 5
5. Antennae black; all femora with black markings 6
   Antennae entirely or partly yellow to orange; legs predominantly yellow, the hind femora black on apical third ..... *pilosula* Beck.
   Antennae yellow, the third segment infuscated at apex; legs yellow, the middle femora black to brown on basal halves .. *nudiuscula* (Lw.)
6. Body long and slender; cheeks linear; basal halves of all femora, bases of the hind tibiae, and the metatarsi, yellow ..... *longipes* (Lw.)
   Body short; cheeks not linear; legs predominantly black. *frit* var. *nitidissima* (Mg.)
7. Antennae entirely or partly yellow to orange 8
   Antennae entirely black 10

8. Vertical triangle shining black .....*coxendix* var. *obscura* (Coq.)
   Vertical triangle gray pollinose 9
9. Small, slender species; front narrow, yellow, the triangle reaching to slightly beyond the middle of the front; a pair of stout, black, intrahumeral bristles present; fore and mid tibiae and all tarsi yellow .....*bispina* (Mall.)
   Broadly-built species; front broad, anterior portion yellow, posterior reddish, the triangle very short and broad; no intrahumeral bristles present; all tibiae and tarsi more or less infuscated ..*hinkleyi* (Mall.)
10. Front and face entirely black; mesonotum dark, sparsely pollinose. *frit* (L.)
    Front and face yellow to reddish; mesonotum light gray to brown-gray pollinose 11
11. Vertical triangle shining black; legs almost entirely black. *coxendix* (Fitch)
    Vertical triangle gray pollinose; at least the tibiae and tarsi chiefly yellow .....*incerta* Beck.
12. Mesonotum not vittate, more or less infuscated on the disk; if obscurely vittate, the stripes do not reach the middle of the disk 13
    Mesonotum distinctly vittate 14
13. Mesonotum with a pair of stout black intrahumeral bristles, and the occiput with distinct postocular bristles .....*spiniger* (Mall.)
    No intrahumeral or postocular bristles present .....*minor* (Ad.)
14. Four short, reddish-yellow stripes on a dark gray to reddish-gray disk .....*marginalis* (Mall.)
    Four gray to black stripes on a yellow disk, the median pair only narrowly separated .....*frontalis* (Tuck.)

Oscinella pilosula Beck. and *O. longipes* (Lw.) have not been found in Kansas material. However, Becker (1912) listed these species from "Opelousas, Lawrence, April (Coll. Melander)", and it is barely possible that he intended to include them from both Louisiana and Kansas. The record probably should have read "Opelousas, Louisiana", and the species have been placed in the key with a strong doubt of their occurrence in Kansas.

Oscinella nudiuscula (Lw.) was recorded from Douglas County by Snow (1903) and Tucker (1907b), but examination of the specimen in the Snow Collection showed that it is really *Hippelates pallipes* (Lw.). In view of this error, and the fact that the few published records seem to indicate an eastern distribution, the species is not included in the state list. Specimens from Fayetteville, Arkansas, have been seen, however, and it is probable that the species occurs in southeastern Kansas.

59. **Oscinella abdominalis** (Becker) New combination

1912. *Siphonella abdominalis* Becker, Ann. Mus. Nat. Hung., x, p. 99. (Chloropidae, IV.) [Onaga, Kansas.]

1912. *Oscinella bifurca* Becker, Ann. Mus. Nat. Hung., x, p. 109. (Chloropidae, IV.) [Onaga, Kansas.] (New syn.)

An interesting situation, which calls for further comment, was discovered here. *Siphonella abdominalis* and *Oscinella bifurca* were each described from a single specimen, sex not stated, collected at Onaga, Pottawatomie County, Kansas, in June, by F. F. Crevecoeur. Each was described as unique in its genus, because of the very striking contrast of a shining black thorax and entirely pale yellow to whitish yellow abdomen. The only difference between the two, in so far as the descriptions were concerned, was that *abdominalis* had entirely yellow antennae, whereas in *bifurca* the third segment was infuscated at the apex.

The examination of a small series from Riley and Ottawa counties indicates the above synonymy, with *abdominalis* chosen because of page priority. Among the specimens from Ottawa County is a pair taken in coitu, the male of which agreed with *abdominalis* and the female with *bifurca;* the sexes in the other specimens could likewise be separated in this way. The males have entirely yellow antennae, shining black hypopygium, anterior portion of the front rather broadly yellow, and a slightly elongated distal segment of the proboscis; the females, on the other hand, have the third antennal segment brown at the apex, front orange to reddish-brown, and the distal segment of the proboscis short and rather broad and fleshy. In both sexes there is a weak vibrissal hair, the eyes are bare, and the distal segment of the proboscis is not as long as the proximal, although in the male it is subequal to it in length.

It may also be noted that the author has recently examined a series of eight specimens (1 ♂, 7 ♀), from several localities in South Dakota [S. Dak. State College Colln.], and these agree with the above interpretation.

Distribution:—Onaga, Pottawatomie County, type locality; 1 ♂, 1 ♀, Riley County, June 18 and 30, 1930, (D. A. Wilbur; sweeping pasture grasses); 2 ♂, Riley County, June 9 and 13, 1934, (C. W. Sabrosky; sweeping slough grass); pair in coitu, and 5 ♂, 4 ♀, Ottawa County, June 24, 1934, (C. W. Sabrosky); [all K.S.C., A.N.S.P., and C.W.S.]. June 9–June 30.

60. **Oscinella umbrosa** (Loew)

1863. *Oscinis umbrosa* Loew, Berl. Ent. Zeit., VII, p. 39. (Cent., III, no. 73.) [Pennsylvania.]

Becker suggests that this species may be a synonym of the European *O. anthracina* (Meig.), but in the absence of further evidence the species is credited to Loew. It is similar to *Crassiseta nigricornis* Lw., but may be distinguished by the form of the antennal arista and by the absence of the long fronto-orbital bristles. A Kansas specimen was compared with the type at the Museum of Comparative Zoology by Mr. Bates.

Distribution:—1, Miami County, 1915, (R. H. Beamer), [Snow Colln.]. 4, Riley County, May 28, 1930, (R. C. Smith; swept from alfalfa); [K.S.C.]. 1, Douglas County, July 29, 1933, (M. W. Sanderson); 2, Riley County, June 18 and August 29, 1930, (D. A. Wilbur); 1, Riley County, June 2, 1932, (C. W. Sabrosky); [all A.N.S.P. and C.W.S.]. May 28–August 29.

61. **Oscinella bispina** (Malloch)

1918. *Botanobia bispina* Malloch, Bul. Brooklyn Ent. Soc., XIII, p. 109. [Illinois.]

It has been impossible to separate this species from *O. infesta* Becker (1912, 108-109) on the basis of the descriptions, and the two may be synonymous. Until it is possible to study the type of *infesta* and to enlarge upon the inadequate description of that species, the specimens now before the author are recorded as *bispina* Mall. These agree with the detailed description of this species, and with notations on the type made by the writer. In general habitus, *bispina* resembles *O. incerta*, but differs in the color of the third antennal segment and in the presence of a pair of stout intrahumeral bristles. Furthermore, both sexes of *bispina* have dark legs.

Distribution:—3, Miami County, 1915, (R. H. Beamer), [Snow Colln.]. 4, Riley County, May 2, June 13, and June 17, 1934, (C. W. Sabrosky; sweeping slough grass), [C.W.S.]. May 2–June 17.

62. **Oscinella hinkleyi** (Malloch)

1915. *Botanobia hinkleyi* Malloch, Canad. Ent., XLVII, p. 12. [Illinois.]

In the small series recorded here, some individuals show four shining black vittae on the gray mesonotum as Malloch stated, and others show an entirely pollinose mesonotum, with the four vittae slightly darker because they are only sparsely pollinose.

In all other details, the specimens agree perfectly with Malloch's description. It is curiously like *Madiza latifrons* (Lw.) in dorsal view, although it will hardly be confused with that species because of the elongate proboscis and anteriorly produced margin of the mouth which are characteristic of the genus *Madiza*. The type, in the collection of the Illinois Natural History Survey, has been examined by the author.

Distribution:—1, Douglas County, August 22, 1920, (Wm. E. Hoffmann); 2, Johnson County and Miami County, 1915, (R. H. Beamer); 1, Osage County, June 15, 1923, (R. H. Beamer); [all Snow Colln.]. 7, Riley County, April 24, June 6, October 3 and 17, 1930, May 26, 1933, and May 11 and July 3, 1934, (D. A. Wilbur); swept from pasture grasses). [all K.S.C., A.N.S.P., and C.W.S.]. April 24–October 17.

63. **Oscinella frit** (Linné)

1758. *Musca frit* Linnaeus, Systema Naturae, ed. X, p. 598.

Synonyms: *Oscinis nigra* Tucker, *O. soror* Macq. var., *pusilla* Meig. (=*O. carbonaria* Lw.), var. *nitidissima* Meig. (=*O. variabilis* Lw.).

A common, widely distributed, and quite variable species. Aldrich (1920), in his extensive study of the frit-fly in North America, verified or established the above synonymy, and redescribed the species to include all varieties.

Oscinella frit has been recorded from Kansas under various names, by Aldrich (1920), Snow (1903), and Tucker (1907a, b). It is common in sweepings from young wheat and pasture grasses, and is often reared from volunteer wheat. In Professor Wilbur's sweepings on pasture grasses, *frit* ranked fourth in abundance, with 1,190 out of the total of 11,233 specimens. The data recorded there (by Wilbur and Sabrosky) [12] indicate three generations a year in Kansas.

Distribution:—Statewide. Besides the large number from Riley County, several hundred specimens have been identified, from Allen, Bourbon, Cherokee, Coffey, Cowley, Crawford, Douglas, Harper, Johnson, Kiowa, Linn, Lyon, McPherson, Miami, Montgomery, Ottawa, Pottawatomie, Reno, Riley, Saline, Sedgwick, Stafford, and Sumner Counties. [Snow Colln., A.N.S.P., K.S.C., and C.W.S.]. Specimens were taken on the flowers of *Lepidium draba* near Manhattan, and one in Pottawatomie County caught on the sticky stem of a large *Pentstemon* species. April 18–November 9.

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[12] See footnote 2.

63a. **Oscinella frit** var. **nitidissima** (Meigen)

Distribution:—4, Douglas County, May and June (Tucker), recorded in litt. as *Oscinis soror;* 3, Miami County, 1915, (R. H. Beamer); [all Snow Colln.]. 1, Sedan, Chautauqua County, November 9, (R. H. Painter), [K.S.C.]. 1, Riley County, May 9, 1933, (D. R. Musser); several, Stafford County, April 29, 1934, (C. W. Sabrosky and R. H. Painter); [C.W.S.]. April 29 – November 9.

The variety *pusilla* could also be recorded from Kansas, but the variation in the extent of color on the legs is so great that no attempt was made to separate this variety from the typical form.

64. **Oscinella coxendix** (Fitch)

1856. *Oscinis coxendix* Fitch, Second N. Y. Report, p. 301.

Coxendix is a common species in Kansas, and ranked fifth in Wilbur's pasture collection, with 1,087 out of 11,233 specimens. It is a black, gray pollinose species, with black antennae (except in the variety *obscura* Coq.), some yellow on the front and face, shining black triangle, and predominantly black legs.

It is probable that this species passes the winter as an adult, in hibernation, for it may be collected in low areas, gullies, and along streams on the earliest warm days of spring. One adult was collected in hibernation at Manhattan, Kansas, January 11, 1935, by the writer and Mr. Ted Sommers, and one in hibernation in a clump of wheat, December 29, 1934, by Mr. A. L. Robinson.

Individuals are occasionally taken on flowers, such as white sweetclover, *Eupatorium* spp., and *Sophia* sp., but it is not a common flower visitor. According to the published records, the species has usually been reared from plants previously injured by other insects, and from insect burrows. One specimen was reared by Dr. R. H. Painter, July 16, 1929, from a mud dauber's nest collected on July 11 at Manhattan, Kansas. Three generations a year are indicated by collecting data of Wilbur and Sabrosky.[13]

Distribution:—Statewide. Recorded by Tucker (1907a, b) from Douglas County in April and June, and from Sedgwick County in April. Besides the large number collected at Manhattan, several hundred specimens have

[13] See footnote 2.

been determined, from Atchison, Bourbon, Butler, Chautauqua, Cherokee, Cowley, Douglas, Ellsworth, Finney, Harper, Hodgeman, Johnson, Linn, McPherson, Marshall, Meade, Miami, Montgomery, Osage, Ottawa, Pottawatomie, Reno, Riley, Sedgwick, Seward, Stafford, and Sumner Counties. [Snow Colln., A.N.S.P., K.S.C., and C.W.S.]. March 27–November 5.

64a. **Oscinella coxendix** var. **obscura** (Coquillett)

1900. *Oscinis obscura* Coquillett, U. S. Nat. Mus. Proc., XXII, p. 266. [Porto Rico.]

The variety differs from the typical form in the yellowish to orange base of the third antennal segment. It was originally described from Porto Rico as a distinct species, but Becker considered it merely a variety of *coxendix*, and the same variety occurs in Kansas. One extreme variation from Hodgeman County has an almost entirely yellow third antennal segment.

Distribution:—15 specimens, from Cherokee, Douglas, Hamilton, Hodgeman, Reno, and Riley Counties, [Snow Colln., A.N.S.P., K.S.C., and C.W.S.]. April 9–November 9.

65. **Oscinella incerta** Becker

1912. *Oscinella incerta* Becker, Ann. Mus. Nat. Hung., X, p. 116. (Chloropidae, IV.) [Washington, Idaho.]

This species is similar to *coxendix*, differing chiefly in having a gray pollinose vertical triangle.

An interesting case of sexual dimorphism was discovered in the species, as a result of the examination of a series of nearly 300 specimens, in which the proportion of the sexes was about equal. The species was described from Washington and Idaho [Coll. Melander] as having the femora and hind tibiae broadly brown on the middle. In the Kansas material, such dark-legged individuals, determined as *incerta* Beck., were found to be always males, whereas individuals collected at the same time on the same grass plot, and agreeing with the males in every detail except for their yellow legs, were without exception females. On these females, the legs, including the fore coxae (black in the males), are almost entirely pale yellow, with only the oval "sensory area" on the postero-dorsal surface of the hind tibiae, and the distal one or two segments of the tarsi, infuscated.

From the original description, one might infer that Becker did not see the female of the species. However, the author recently had an opportunity to examine the type series in the collection of Prof. A. L. Melander, and found that only two of the nine specimens were males. Three paratypes in the C. W. Johnson collection were also found to be females. It would appear, therefore, that in this species, Becker did not recognize the sexual dimorphism, which seems distinct enough to be worthy of mention.

Distribution.—146♀, Manhattan, Riley County, May 16–August 1, (D. A. Wilbur; sweeping pasture grasses); 144♂, same locality, May 16–July 24, (D. A. Wilbur; sweeping pasture grasses), [all C.W.S., K.S.C., A.N.S.P.].

Of the total of 290 specimens, 286 were collected between May 16 and June 4, which is the usual period of the large spring generation for many species of Chloropidae.

66. **Oscinella spiniger** (Malloch)

1918. *Botanobia spiniger* Malloch, Bull. Brooklyn Ent. Soc., XIII, p. 109. [Illinois.]

Spiniger and *O. minor* (Ad.) are very similar, but the former possesses the intrahumeral and postocular bristles, and has the abdomen generally infuscated. According to the original description, the mesonotum is fuscous posteriorly, with the dark color carried forward as narrow lines dividing the anterior half of the notum into four short yellow vittae. On many specimens, however, and indeed on the type itself as observed by the writer, this anterior area is paler, but not always distinctly vittate. Considerable variation exists among the specimens now before the writer in the extent of dark color on the occiput, and apparently it is not a stable character.

Distribution:—2, Miami County and Bourbon County, 1915, (R. H. Beamer), [Snow Colln.]. Several, McPherson County, July 1, 1934, (C. W. Sabrosky and R. H. Painter); 3, Douglas County, September 30, 1933, (H. M. Smith); 1, Ottawa County, April 30, 1933, (C. W. Sabrosky); 2, Sand Dunes, Medora, Reno County, June 8, 1933, (C. W. Sabrosky); 1, Hutchinson, Reno County, June 30, 1934, (C. W. Sabrosky); 1, Manhattan, Riley County, October 17, 1933, (C. W. Sabrosky); [all C.W.S., K.S.C., A.N.S.P.]. April 30–October 17.

67. **Oscinella minor** (Adams)

1905. *Oscinis minor* Adams, Ent. News, XVI, p. 110. [Louisiana].
1914. *Botanobia proxima* Malloch, Psyche, XXI, p. 25. [Virginia.]
1915. *Botanobia* (*Oscinis*) *proxima* Malloch, Ent. Soc. Wash. Proc., XVII, p. 162.

This is a small species, with yellow head and body color; mesonotum dark reddish-gray on the disk, sparsely dusted; triangle short, dull yellow, with black ocellar spot; third antennal segment yellow with black apex and dorsal third; pleura yellow, rarely with a black spot on the sternopleura. The type specimens have been lost.

Oscinella minor is very common in Kansas. At Manhattan, it was by far the most abundant species found in sweeping pasture grasses, with 3,666 out of the total of 11,233 specimens, or about one-third. The summary of these data by Wilbur and Sabrosky [14] indicated three generations per year. Rearings from volunteer wheat usually show a good proportion of this species, as do sweepings on wheat. A few have been collected on flowers, especially on *Eupatorium* and *Solidago* species.

Distribution:—Besides the several thousand specimens collected at Manhattan, a large series was identified, from Atchison, Bourbon, Cloud, Cowley, Crawford, Dickinson, Douglas, McPherson, Miami, Ottawa, Pottawatomie, Reno, Republic, Riley, Sedgwick, Stafford, and Sumner Counties, [all Snow Colln., K.S.C., A.N.S.P., and C.W.S.]. April 14–November 1.

68. **Oscinella marginalis** (Malloch)

1914. *Botanobia marginalis* Malloch, Psyche, XXI, p. 25. [Florida.]

Specimens of *marginalis* have four distinct, clearly marked, pale yellowish vittae on a reddish-gray mesonotum, the median pair only slightly shorter than the lateral. The third antennal segment is almost entirely yellow, only faintly browned at the point of insertion of the arista. A characteristic, horizontal black stripe on the middle of the pale yellow pleura is a noteworthy feature. A Kansas specimen was compared with type at the U. S. National Museum by Mr. C. T. Greene.

Distribution:—1, Crawford County, 1915, (R. H. Beamer); 1, Miami County, 1915, (R. H. Beamer); [Snow Colln.]. Several, Ottawa County, June 24, 1934, (C. W. Sabrosky); 1, Ottawa County, April 30, 1933, (R. H.

[14] See footnote 2.

Painter); 1, Douglas County, September 30, 1933 (H. M. Smith); 1, Saline County, June 7, 1933, (C. W. Sabrosky); 1, Riley County, June 4, 1933, (C. W. Sabrosky); 97, Riley County, 1930–1933, (D. A. Wilbur; sweeping pasture grasses); [K.S.C., A.N.S.P., and C.W.S.]. April 30–October 3.

69. **Oscinella frontalis** (Tucker)

1908. *Oscinis frontalis* Tucker, Ent. News, XIX, p. 273. [Texas.]

The Kansas specimens show a series of variations, from the short mesonotal stripes which fail to reach the scutellum, as stated in the original description, to very long stripes, with the two median stripes fusing and passing onto the disk of the scutellum, as a black spot. The species is fairly robust, pale yellow, the body and legs thickly covered with fine, short, pale yellow hairs, the front with slightly darker hairs, and the eyes thickly studded with short, pale pubescence. A Texas specimen was compared with the type at the U. S. National Museum by Mr. C. T. Greene.

Distribution:—1, Douglas County, July (E. S. Tucker); 1, Osage County, June 15, (R. H. Beamer); 5, Butler, Lyon, and Montgomery Counties, 1916, (R. H. Beamer), [Snow Colln.]. 1, Riley County, July 25, 1933, (R. H. Painter); 12, Riley County, 1930–1934, (D. A. Wilbur; sweeping pasture grasses); 2, Riley County, May 16, 1934, and June 4, 1933, (C. Sabrosky); 1, Riley County, September 19, 1933, (C. W. Sabrosky; reared from volunteer wheat); 1, Stafford County, June 30, 1934, (C. W. Sabrosky); [K.S.C., A.N.S.P., and C.W.S.]. May 2–September 19.

Addenda

Ectecephala laevifrons. There are two cotypes of this species from Onaga, Kansas, May 12, 1906 (Crevecoeur), in the U. S. National Museum. They are nothing more than a dark form of *albistylum* Macq. Whether the rest of the series also falls into synonymy under Macquart's name remains to be seen.

Ectecephala sulcifrons. The Kinsley specimen of this species was bred from *Calamagrostis.*

Madiza trivittata Sabrosky is typical *cinerea* Loew, 1863. (New syn.)

Madiza quinquelineata (Adams) is *Oscinella trigramma* (Loew, 1863). (New syn.)

Madiza cinerea. This is not Loew's species and, with the variety of *cinerea* mentioned by Becker (1912, p. 97) represents another species.

Oscinella halterata (Malloch), Ins. Insc. Mens., I, p. 47, 1913

One specimen of this species from Douglas County, (F. H. Snow), has been found in material from the Snow Collection and compared with the type in the U. S. National Museum.

Oscinella coxendix var. *obscura.* A variety which differs from the typical form in the yellowish to orange base of the third antennal segment has been found in the Kansas material. Becker considered this as var. *obscura* Coquillett. Examination of the type of obscura in the National Museum, however, showed that it is very close to *Oscinella frit* var. *pusilla,* and is certainly not *coxendix* nor any variety of it.

Oscinella spiniger is a synonym of *O. dorsata* (Loew) and the citation of this species should be as follows:

66. **Oscinella dorsata** (Loew)

1869. *Oscinis dorsalis* Loew, Berl. Ent. Zeit., XIII, p. 43. (Cent., VIII, no. 77.) [Rhode Island.]

1872. *Oscinis dorsata* Loew, Berl. Ent. Zeit., XVI, p. 115. (=*dorsalis* Loew 1869 nec 1863.)

1918. *Botanobia spiniger* Malloch, Bul. Brooklyn Ent. Soc., XIII, p. 109. [Illinois.] New synonym.

The author has seen the types of both species, and *spiniger* Malloch is a good synonym. The intrahumeral bristles upon which Malloch based his species are also present in *dorsata,* though not mentioned in Loew's description. Considerable variation exists in the extent and intensity of dark color on the mesonotum, and in some specimens the mesonotum appears quite vittate. Beyond couplet 12 in the key, however, the presence of the intrahumerals will separate the species from all others, and especially from *minor* (Ad.), with which it has often been confused in published records.

Oscinella frontalis. In reworking my material, I found that the series under this name is *Oscinis flavescens* Tucker, Ent. News, XIX, p. 272, 1908. [Colo.]. The name *flavescens* should therefore be substituted in this paper. *Frontalis* is apparently a southern species.

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1907b..Some results of desultory collecting of insects in Kansas and Colorado. *Kans. Univ. Sci. Bul.*, IV, pp. 51–108. (Chloropidae, pp. 105–106; repeats the records of Tucker 1907a.)

1909..Additional results of collecting insects in Kansas and Colorado. *Kans. Acad. Sci. Trans.*, XXII, pp. 276–304. (Chloropidae, p. 303.)

STUDIES IN THE ORTHOPTERA OF ARIZONA

PART II. A LIST OF THE DERMAPTERA AND ORTHOPTERA OF ARIZONA WITH NEW RECORDS AND CORRECTIONS OF THE LITERATURE SUBSEQUENT TO 1900

BY MORGAN HEBARD

The first of these two studies, containing the descriptions of two new genera, eleven new species and one new geographic race, has recently appeared.[1]

While travelling westward, July 23, 1907, the train stopped for a few minutes at Railroad Pass in Cochise County, Arizona. Not having been in that State before, the author, with the enthusiasm of his then twenty years, scrambled off and hurriedly examined a small area beside the track, capturing a single grasshopper which proved to be an undescribed species, upon which specimen *Eremiacris acris* (Rehn and Hebard) was based. Since that day very many more have been spent in field work in Arizona and all of such days have been tinged with the same eager expectancy, born of the knowledge that nowhere in the United States is there a more varied fauna or one in which a most unexpected form of life is more likely to be found. Coupled with this is the glorious climate for camping, which permitted us to rest on the ground or on army cots without the need of a tent on the vast majority of nights. These were spent in the bowl of great desert valleys, in many a mountain canyon, high up on the mountain slopes or in the magnificent Canadian Zone forests on the flat surfaces of the mighty plateaus. We have worked diligently all along the Mexican line and north to the extreme northwest corner of the State. Additional material is still needed, however, to solve a few of the most difficult problems. The total of collections assembled is now exceedingly large, but we have

[1] Trans. Amer. Ent. Soc., LXI, pp. 111 to 153, (1935).

published very little except in certain revisions of groups or genera, feeling that a study of the Orthoptera of Arizona must succeed many other faunistic studies for regions where the fauna is far less varied and is better understood. At present such studies are carrying our work as far southwest as Texas and northern New Mexico. A general treatment of the Orthoptera of Arizona will logically follow.

At this time Dr. E. D. Ball of the University of Arizona, who is preparing a study in the same field from an economic point of view, has sent us his list of the Arizona species for correction. We first attempted to do this for him by checking from our determined material, both recorded and as yet unreported. The obstacles confronting us were quickly seen to be insurmountable without far more work than was originally intended. Realizing that our final paper would be greatly benefited by the elimination of much synonymy and correction of many past determinations, we decided on the present study.

The publications on this subject in the early part of the century were undertaken at a time when the Orthoptera of the Southwest was very little understood. This resulted naturally in a number of incorrect determinations being made and to these were unfortunately added many records of odd specimens which had been carelessly and incorrectly labelled long before as from Arizona, while in a small collection received from E. J. Oslar by J. A. G. Rehn very serious confusion in labelling had taken place.

The Arizona list is here made as complete as possible by describing all of the new species from there in our collections, giving the records of all species not previously known from Arizona, giving all synonymy involving names found in the literature for the State and correcting all of the erroneous records appearing in the literature since 1900. The most important papers, wholly or in part on Arizona, which have appeared during this time are the following:

1901. Caudell. On Some Arizona Acrididae. *Can. Ent.*, XXXIII, pp. 102 to 106.

1903. Caudell. Some New or Unrecorded Orthoptera from Arizona. *Proc. Ent. Soc. Wash.*, V, pp. 162 to 166.

1904. Rehn. Notes on Orthoptera from Arizona, New Mexico and Colorado. *Proc. Acad. Nat. Sci. Phila.*, LVI, pp. 562 to 575.

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1905. Caudell. On a Collection of Orthoptera from Southern Arizona, with Descriptions of New Species. *Proc. U. S. Nat. Mus.*, XXVIII, pp. 461 to 477.

1905. Rehn. Notes and Descriptions of Orthoptera from the Western United States. *Trans. Kansas Acad. Sci.*, XIX, pp. 221 to 231.

1907. Rehn. Notes on Orthoptera from Southern Arizona, with Descriptions of New Species. *Proc. Acad. Nat. Sci. Phila.*, LIX, pp. 24 to 81.

1907. Snow.[2] Results of the Entomological Collecting Expedition of the University of Kansas to Pima County, Arizona. List of Orthoptera collected 1902 to 1906. *Trans. Kansas Acad. Sci.*, XX, part II, pp. 161 to 164.

1908. Rehn and Hebard. An Orthopterological Reconnoissance of the Southwestern United States. Part I. Arizona. *Proc. Acad. Nat. Sci. Phila.*, LX, pp. 365 to 402.

1911. Rehn. Orthoptera from the Santa Rita Mountains, Collected by the University of Kansas Expedition. *Kansas Univ. Sci. Bull.*, V, pp. 299 to 306.

1933. Hebard. Orthoptera to be Found in Winter and Spring in and near Tucson, Arizona. *Ent. News*, XLIV, pp. 231 to 235.

It must be remembered, however, that since 1900 other Arizona records are scattered through the literature, while many for the State are to be found in the numerous revisions and monographs of groups and genera which have appeared.

In addition the author has studied all available Mexican material, much from that country, particularly in its northwestern portion, being of importance in reaching proper conclusions as to the species and races of the southwestern United States. The most important of the resultant publications are the following.

1917. Notes on Mexican Melanopli. *Proc. Acad. Nat. Sci. Phila.*, 1917, pp. 251 to 275.

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[2] Though Snow credited Rehn "for the determination of a large portion of the material" he did not state that he had also sent at the same time large series to Caudell, also for determinations, which latter were used freely in his list. Due to the fact that at that time the Orthoptera of Arizona was not well understood by anyone, different names for the same species were supplied in a number of cases. The result was that, though that list gives 128 species and races, 113 were actually represented and two of these were due to mislabelling, representing species which do not occur in Arizona.

1921. Mexican Records of Blattidae. *Trans. Amer. Ent. Soc.*, XLVII, pp. 199 to 220.

1923. Dermaptera and Orthoptera from the State of Sinaloa, Mexico. Part I. *Trans. Amer. Ent. Soc.*, XLVIII, pp. 157 to 196. 1925. Part II. Ibid., LI, pp. 265 to 310.

1923. Expedition of the California Academy of Sciences to the Gulf of California in 1921. *Proc. Cal. Acad. Sci.*, (4), XII, pp. 319 to 340.

1924. A Revision of the Genus Taeniopoda. *Trans. Amer. Ent. Soc.*, L, pp. 253 to 274.

1931. Studies in Lower Californian Orthoptera. *Trans. Amer. Ent. Soc.*, LVII, pp. 113 to 127.

1932. New Species and Records of Mexican Orthoptera. *Trans. Amer. Ent. Soc.*, LVIII, pp. 201 to 371.

The list of species for Arizona will probably require very little future change except where complete revisionary studies are necessary but which can not be undertaken at present, due either to lack of sufficient material or time. We are not yet satisfied as to the status of certain species or races of the genera *Arphia, Leprus, Trachyrhachis, Conozoa, Trimerotropis, Schistocerca, Aeoloplus* and *Melanoplus*.

We wish to thank particularly Mr. A. N. Caudell of the United States National Museum and Dr. R. H. Beamer of the University of Kansas for the loan of all material which we had reason to believe had been incorrectly determined, and Professor E. D. Ball and Dr. C. T. Vorhies of the University of Arizona and Dr. J. C. Bradley of Cornell University for submitting all of their material for study. Important material has also been sent us for correction of past determinations by Mr. N. Banks of the Museum of Comparative Zoology. Outside our own extensive collections we have obtained further large Arizona series by purchase from O. C. Poling, J. A. Kusche and E. R. Tinkham.

The following list includes the two hundred and thirty species and eighteen races known to be native in Arizona, to which are added the nine adventive species of Blattidae which have been found there and the nine new species of *Ceuthophilus* soon to be described by Hubbell are also noted.

The total for the State therefore stands at two native species of Dermaptera and two hundred and fifty-five native species and races of Orthoptera. Though additions will undoubtedly be made, we believe their number will not be large.

DERMAPTERA

Labiidae

SPONGIPHORINAE

Spongovostox apicedentatus (Caudell)

Described from Tucson in 1905 and then referred to *Spongiphora.* Material from Florence had previously been incorrectly determined as *Labia melancholica* Scudder.

Forficulidae

FORFICULINAE

Doru lineare (Eschscholtz)

Arizona material was recorded as *Apterygida linearis* prior to the description of *Doru* in 1907.

ORTHOPTERA

Blattidae

PSEUDOMOPINAE

Latiblattella lucifrons Hebard

Type locality—Santa Rita Mountains. Arizona material had previously been recorded as *Blattella dilatata* (Saussure) a name referable to a very closely related central Mexican species of *Latiblattella.*

Supella supellectilium (Serville) (An introduction.)

The first material from the southwestern United States is now before us, taken at Tucson by E. D. Ball. The insect is a widespread household pest in the American tropics, which probably originally was introduced into the New World from Africa.

Blattella vaga Hebard (An introduction.)

Type locality—Phoenix.

Blattella germanica (Linnaeus) (An introduction.)

Parcoblatta notha (Rehn and Hebard)

Type locality—Huachuca Mountains, described in 1910 and then referred to *Ischnoptera.* All Arizona records for *Ischnoptera uhleriana fulvescens* Saussure and Zehntner given at that time,

as well as all prior records from Arizona for *Ischnoptera uhleriana* Saussure were incorrect, being based on material of this species. Both *uhleriana* and *fulvescens* are now known to be valid eastern species of the genus *Parcoblatta,* the latter occurring farthest west, as far as central Texas.

Though *Pseudomops septentrionalis* Hebard, described in 1917, was reported as *Pseudomops oblongata* Linnaeus from the San Bernardino Ranch in Cochise County by F. H. Snow in 1907, we feel that, as is the case with material of *Syrbula admirabilis* (Uhler) from the same lot, mislabelling has certainly occurred and that the name should not appear in an Arizona list. The species is not otherwise known to the east further west than Del Rio, Texas, nor north of Venvidio, Sinaloa on the Pacific Coast.

BLATTINAE

Neostylopyga rhombifolia (Stoll) (An introduction.)

This insect was referred to *Blatta* and *Stylopyga* until the description of *Neostylopyga* in 1911.

Blatta orientalis Linnaeus (An introduction.)

Reported as *Stylopyga* by Snow in 1907.

Periplaneta americana (Linnaeus) (An introduction.)

NYCTIBORINAE

Nyctibora sp. (An introduction.)

An immature has alone been received from Arizona, having reached a store there in fruit from the American tropics. Several species of *Nyctibora,* a genus peculiar to the tropics of the New World, are liable to reach the United States in this manner.

PANCHLORINAE

Panchlora cubensis Saussure (An introduction.)

Similarly transported to Arizona.

CORYDIINAE

Holocompsa azteca (Saussure) (An introduction.)

Similarly transported to Arizona.

Compsodes schwarzi (Caudell)

Type locality—Madera Canyon, Santa Rita Mountains, described in 1903 and then referred to *Latindia*. The genus *Compsodes* was proposed in 1917.

POLYPHAGINAE

Arenivaga grata Hebard

Arenivaga erratica (Rehn)

Described from Prescott in 1903 when *Arenivaga* was proposed as a subgenus of *Homoeogamia*. Recorded as *Homoeogamia bolliana* Saussure from Oak Creek Canyon and the Baboquivari Mountains by Snow in 1907. The species was reported from Arizona and referred to that genus until *Arenivaga* was raised to generic rank in 1913.

Arenivaga apacha (Saussure)

Originally referred to *Homoeogamia* and not recorded as *Arenivaga* until 1913. *Homoeogamia apacha infuscata* Caudell, described from Phoenix in 1905, was placed in the present synonymy by the author in 1917.

Arenivaga genitalis Caudell

Type locality—Phoenix.

Eremoblatta subdiaphana (Scudder)

MANTIDAE

AMELINAE

Yersiniops solitarium (Scudder)

Arizona material was referred to *Yersinia* until the description of *Yersiniops* in 1931.

Yersiniops sophronicum (Rehn and Hebard)

Type locality—Sonora Road Canyon, Tucson Mountains. Also referred to *Yersinia* until 1931.

Litaneutria minor (Scudder)

1872. *Stagmatoptera minor* Scudder, U. S. Geol. Surv. Nebraska, Final Rept., pt. 3, p. 251. [Adults; Nebraska City, Nebraska.]

1892. *Litaneutria ocularis* Saussure, Soc. Ent., VII, p. 123. [♂; [northern Sonora, 1894], Mexico.]

1896. *Litaneutria obscura* Scudder, Can. Ent., XXVIII, p. 209. [♂: Arizona; southern California; Lower California.]

1896. *Litaneutria pacifica* Scudder, Can. Ent., XXVIII, p. 210. [♂; Shasta region, California.]

1907. *Litaneutria skinneri* Rehn, Proc. Acad. Nat. Sci., Phila., 1907, p. 26, fig. 1. [♂, ♀; Carr Canyon, Huachuca Mountains, Arizona.]

1929. *Litaneutria longipennis* Beier, Zool. Anzeig., LXXX, p. 137. [♂; "Tuskuo" (evidently error for Tucson), Arizona.]

From an early date decided confusion appears in the literature on *Litaneutria,* partially due to superficial treatment, partly to the fact that extreme variation occurs in both size, robustness and color in the single species we are now convinced is concerned.[3] Its range is very extensive, reaching north to North Dakota, Montana and Washington and south to Tamaulipas, Chihuahua, Sonora and to the southern extremity of Baja California. With the type locality for *obscura* selected below we believe that all other prior names must be synonymized under *minor.*

From hundreds of specimens at hand we find that over the Great Plains to Chihuahua the eyes show a slight tendency toward dorso-external angulation, their contour there not being evenly convex as in material from the Great Basin and all other western localities except that from southern coastal California, in which the dorso-external ocular angulation is often pronounced. Such difference as is shown between eastern and western material is too weak and variable to warrant the recognition of races, but further investigation may prove the southern coastal Californian insect to be racially distinguishable. In order to dispose of the name *obscura,* proposed for material merely on the basis of its decidedly intensive coloration, we therefore select Arizona as the type locality.

Saussure and Zehntner in 1894 unfortunately stated for *Litaneutria* that the eyes were acute, tuberculate, the figure of the single specimen which they had showing this statement to be erroneous, though the eyes are not quite as broadly rounded

[3] In recent papers we have recorded the species as *minor* from the United States and as *ocularis* from Mexico, stating that a single species was probably involved but that races might exist. Unfortunately we consistently gave the incorrect impression that *ocularis* and not *minor* was the earliest name.

dorsad as is usually the case in material from the southwest. Scudder's *pacifica* was based on an obscure but recessively marked specimen; Rehn's *skinneri* on the first brachypterous male to be studied (a surprising condition now known to appear occasionally in many portions of the range of the species though macropterous males are very much more frequently encountered), while Beier's *longipennis* represents merely the normal southwestern type in which the eyes are prominent and evenly rounded and the male is macropterous.

OLIGONICINAE

Oligonicella mexicana (Saussure and Zehntner)

All Arizona records in past literature of *Bactromantis virga* Scudder are referable to this species. That name was established as a synonym of *Stagmomantis carolina* (Johannson) by Rehn and Hebard in 1916.

MANTINAE

Stagmomantis limbata (Hahn)

Stagmomantis californica Rehn and Hebard

Hitherto recorded as from "Arizona" material is before us from Benson, the Santa Catalina Mountains (A. A. Nichol), Cat Pass in the Tucson Mountains, Snyder's Hill, Sahuaro plain west of Tucson Mountains, Flux in Alum Canyon, Nogales (E. D. Ball), Bear Valley in the Pajaritos Mountains, near Oro Blanco, Roadside Mine in the Coyote Mountains, Sycamore, Schaeffer and Hendricks Canyons in the Baboquivari Mountains, Komalik, Fortification Rock, Quijotoa Mountains east of Pozo Blanco, Childs, Batamote Well in Valley of the Ajo, Ajo, Growler Valley, Quitobaquita Hills, Roosevelt (J. C. Bradley), Congress Junction (J. C. Bradley), Littlefield (E. D. Ball), Sacramento Wash in Mohave County (O. C. Poling), Sawmill Canyon in Hualapai Mountains (O. C. Poling), Kingman (O. C. Poling), Boulder Springs (O. C. Poling), Topock (O. C. Poling), Palomas (J. C. Bradley), Wenden (Mrs. W. W. Gnash). Rehn and Hebard secured the material at the localities where the collector is not mentioned.

Rehn in 1904 recorded males from Florence as *Stagmomantis carolina* (Johannson), a species which in the United States does not occur west of extreme eastern New Mexico and in 1907 reported material from the San Bernardino Ranch and Phoenix as *S. limbata* but at that time noted the difference between the females and typical females of that species.

Stagmomantis gracilipes Rehn

Type locality—Baboquivari Mountains.

VATINAE

Pseudovates arizonae Hebard

Type locality—Baboquivari Mountains.

PHASMIDAE

PACHYMORPHINAE

Parabacillus hesperus Hebard

Type locality—South slopes of Atascosa Peak in the Pajaritos Mountains. All records of *Parabacillus coloradus* from southern Arizona prior to 1934 are referable to this species.

Parabacillus coloradus (Scudder)

HETERONEMIINAE

Pseudosermyle straminea (Scudder)

Pseudosermyle truncata Caudell is a synonym, established by Hebard in 1929.

Diapheromera arizonensis Caudell

Type locality—Hot Springs in Yavapai County.

Diapheromera femorata (Say)

Naco (Rehn and Hebard), Paradise (O. C. Poling).

Diapheromera covilleae Rehn and Hebard

San Bernardino Ranch in Cochise County, Tucson, Snyder's Hill in Pima County, six miles north of Ajo, Ajo, Growler Valley, Growler Pass in Growler Mountains at 1300 feet, (all Rehn and Hebard).

Acrididae

ACRYDIINAE

Acrydium subulatum (Linnaeus)

We have recently placed *Acrydium granulatum* Kirby as a synonym.

Paratettix aztecus aztecus (Saussure)

We placed *Telmatettix* as a synonym of *Paratettix* in 1924, under which name Arizona material of the species had been previously recorded.

Paratettix cucullatus extensus Morse

The intergradation between *cucullatus* and *mexicanus* noted by us as possible in 1932, has been proved to our satisfaction by further studies, this resulting in our now placing *mexicanus* as a race of *cucullatus* occurring typical in eastern Mexico. All Arizona records of *toltecus* (established by us as a synonym of *mexicanus* in 1932), its race *arizonus* Hancock and form *sonorensis* Hancock, as well as of *mexicanus* are referable to *cucullatus extensus*.

Clypeotettix schochii (Bolivar)

EUMASTACINAE

Eumorsea balli Hebard

Type locality — Ramsey Canyon above the box, Huachuca Mountains.

Morsea californica dumicola Rehn and Hebard

ACRIDINAE

Achurum sumichrasti Saussure

Achurum acridodes (Stål) is a synonym, established by Hebard in 1922.

Mermiria texana Bruner

Papagoa arizonensis Bruner is a synonym, established by Rehn in 1919, based on a dried alcoholic male " from southern Arizona or northern Mexico " in the author's collection.

Mermiria neomexicana (Thomas)

Mermiria maculipennis maculipennis Bruner

All Arizona records of *Mermiria bivittata* (Serville) are referable to this species.

Bootettix punctatus Scudder

All Arizona records of *Bootettix argentatus* Bruner are referable to this species.

Pedioscirtetes nevadensis Thomas

Springerville (E. D. Ball), Flagstaff (Beamer and Russell).

Pedioscirtetes maculipennis (Scudder)

Originally referred to *Acrocara,* which name was placed as a synonym of *Pedioscirtetes* by Hebard in 1926.

The records of *Syrbula admirabilis* (Uhler) from the San Bernardino Ranch and the Baboquivari Mountains are erroneous, as that species does not occur in Arizona. The material was undoubtedly mislabelled.

Syrbula fuscovittata Thomas

Syrbula modesta Bruner is a synonym, established by Hebard in 1929.

Opeia testacea Scudder

Arizona records of *obscura* (Thomas) and *imperfecta* Bruner are referable to this species.

Amblytropidia mysteca (Saussure)

Arizona records of *Amblytropidia occidentalis* (Saussure) are based on material of this species. Discussed by the author in 1933.

Amphitornus ornatus McNeill

1897. *Amphitornus ornatus* McNeill, Proc. Davenport Acad. Sci., VI, p. 225. [♀; Los Angeles, California.]

1908. *Amphitornus nanus* Rehn and Hebard, Proc. Acad. Nat. Sci., Phila., 1908, p. 376, fig. 7. [♂: [rim of Coconino Plateau] Grand Canyon of the Colorado, Arizona.]

From very large series before us we find that *A. ornatus* McNeill is very close to *A. coloradus* (Thomas), differing mainly in being more graceful with less inflated head and vertex averaging more acute. On the Coconino Plateau a depauperate con-

dition occurs, apparently in some ways annectant between the above insects but slightly nearer *ornatus*. To this the name *nanus* applies. The differences shown we do not believe warrant nominal recognition. In fact further study of our material, particularly the series from between the Rocky Mountains and the Sierra Nevada and from north of California, may show that *ornatus* is only a southwestern race of *coloradus*.

Eritettix variabilis Bruner

Phlibostroma quadrimaculatum (Thomas)

Springerville, St. John (E. D. Ball).

Cordillacris occipitalis occipitalis (Thomas) (Atypical.)

Winslow (J. A. G. Rehn), Holbrook. These specimens represent the southwestern phase of the present insect, which differs definitely from the condition found over most of the Great Basin, which we have carefully compared and believe represents atypical *occipitalis cinerea* (Bruner). Furthermore, if that is correct, *affinis* Morse is based merely on material showing the extreme divergence of that condition, limited in distribution to a narrow strip bordering the central Sierras on the east and at best can not be permitted higher than geographic racial status.

Cordillacris crenulata pima Rehn

1907. *Cordillacris pima* Rehn, Proc. Acad. Nat. Sci. Phila., 1907, p. 69, figs. 17 and 18. [♀; Baboquivari Mountains, Arizona.]

1909. *Cordillacris apache* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1909, p. 139, figs. 10 and 11. [♂, ♀; Silver City, New Mexico.]

Comparison of the above types and that of *C. crenulata* (Bruner), all in the Philadelphia collections, with very large series shows that a single species is represented. This insect in the western portions of its distribution averages larger, more graceful, with sharper fastigio-facial angle and deeper eye than it does to the east. All of these characters reach their maximum accentuation in material from the Boboquivari Mountains and we recognize *pima* as a western race. The Silver City, New Mexico series is far from intermediate though it shows divergence toward typical *crenulata* and the name is consequently placed in the present synonymy.

Typical *crenulata* occurs only as far west as Vaughan, New Mexico, but material from northern Arizona averages as small and almost as stocky, though the eyes are deeper, specimens from Springerville, Arizona having the shortest eyes of that series and are the only ones which are virtually intermediate.

All records of *crenulata* from southern Arizona are referable to *crenulata pima.*

Orphulella compta Scudder

1899. *Orphulella compta* Scudder, Can. Ent., XXXI, p. 180. [♂, ♀: Palm Springs, California; Yuma, Arizona.]

1904. *Orphulella graminea* Bruner, Biol. Cent.-Amer., Orth., II, p. 78. [♂, ♀; Phoenix, Arizona.]

Bruner was apparently misled by the original description of *compta* and so described *graminea.* The type and original series of the latter compared with paratypes of the former in the author's collection show that but a single species is represented.

Neopodismopsis abdominalis (Thomas)

San Francisco Mountains, (E. D. Ball).

Acantherus piperatus Scudder

Rock House Canyon in Dos Cabezos Mountains, Santa Catalina Mountains (A. A. Nichol), Santa Rita Mountains (Nichol and Vorhies), Tumamoc Hill in Tucson Mountains, Sonora Road Canyon in Tucson Mountains, Snyders Hill, Sycamore Canyon and Schaeffer Canyon in Baboquivari Mountains, Quijotoa Mountains, Komalik, Fortification Rock, Valley of the Ajo six miles north of Ajo, Ajo, (all Rehn and Hebard unless otherwise noted).

Horesidotes cinereus cinereus Scudder

1899. *Horesidotes cinereus* Scudder, Proc. Amer. Acad. Arts and Sci., XXXV, p. 49. [♂, ♀; Palm Canyon and West Canyon, [San Jacinto Mountains], California.]

1908. *Horesidotes papagensis* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1908, p. 379, fig. 8. [♀; Sonora Road Canyon, Tucson Mountains, Arizona.]

Goodly series compared with paratypes of *cinereus* and the type of *papagensis* in the author's collection show that the latter name is a synonym. The species is decidedly variable and all of the characters originally given to separate *papagensis* from

cinereus are attributable to individual variation. The fastigial width and bluntness are particularly variable and great differences in size and coloration are also found, the size being apparently mainly a response to conditions of immediate environment.

Chorthippus longicornis (Latreille)

We have recently placed *curtipennis* Harris as a synonym.

White Mountains twenty-five miles West of Springerville at 10000 feet (E. R. Tinkham), San Francisco Mountains (E. D. Ball).

Aeropedellus clavatus (Thomas)

The species was referred to *Gomphocerus* until this year. Snow recorded this insect from Oak Creek Canyon in 1907 as *clepsydra* Scudder (a synonym recently established). Jacobs Lake on Kaibab Plateau (E. R. Tinkham), Bright Angel Point on Kaibab Plateau (Rehn and Hebard), San Francisco Mountains at 9200 to 10000 feet (Rehn and Hebard), Flagstaff (R. H. Beamer).

Psoloessa texana pusilla (Scudder)

Rehn in a study of the genus *Psoloessa* nearly completed finds that *Stirapleura pusilla* Scudder is a race of *Psoloessa texana.* Previous Arizona records of Scudder's *texana, maculipennis, buddiana* and *ferruginea* are all based on material of this insect.

Psoloessa delicatula (race of)

Arizona records of *Stirapleura decussata* Scudder, established as a synonym of *Psoloessa delicatula delicatula* (Scudder) by Hebard in 1925, are all based on a southwestern race of this species being treated by Rehn in his revision of the genus.

Scyllina viatoria viatoria (Saussure)

Scyllina calida (Bruner) is a synonym, established by Hebard in 1924, prior to which date all Arizona material had been so recorded.

Ageneotettix deorum deorum (Scudder)

1976. *Chrysochraon deorum* Scudder, Bull. U. S. Geol. Surv. Terr., II, p. 262. [♂; Garden of the Gods, Colorado.]

1904. *Ageneotettix australis* Bruner, Biol. Cent.-Amer., Orth., II, p. 110. [♂, ♀; Phoenix, Arizona.]

We had long felt that the name *australis* would hold, at least as a race, for the southwestern insect which averages larger and shows some reduction of the organs of flight more frequently than does typical *deorum*. Comparison of very large series now available, however, convinces us that *australis* must be placed in the synonymy of this extremely plastic species.

Ageneotettix deorum curtipennis Bruner

In 1929 we observed that *curtipennis* probably represented a local geographic race and comparison of many specimens now before us with very large series of *deorum* reveals that no other feature exists upon which it can be distinguished except very decided brachypterism. The degree of development of the organs of flight shows a particularly wide range in Arizona. In a very large series from Prescott, not only is the width of the fastigium found to exhibit wide variation but the tegminal development ranges from the same as in the type of *curtipennis* to an even greater degree of reduction. Somewhat greater reduction than in the type is normal in that series but there are numerous individuals in which the tegmina are reduced to ovate pads separated by a brief space. This latter condition (with tegminal apices rounded, not angulate or acute) is almost invariably an index of specific distinction in the brachypterous Melanopli, but such is plainly not the case in the present insect where every kind of intergrade appears in the Prescott series.

Throughout northern Arizona *curtipennis* occurs, reaching east and north as far as the Rio de las Animas valley in southwestern Colorado. For this reason and bearing in mind the fact that nowhere else over the very extensive distribution of *deorum* is such decided brachypterism found, we recognize *curtipennis* as a geographic race.

A series from Carr Peaks in the Huachuca Mountains, however, shows very decided reduction in the tegmina of males (slightly more than in our males from Mancos, Colorado, which we discussed in 1929) and quite as much in a female as in some of the least brachypterous females in our series from Carbon

Junction, Colorado. These, though geographically isolated, must be placed as atypical *deorum curtipennis.*

Zapata salutator Rehn

Type locality—Tumamoc Hill, Tucson Mountains.

Drepanopterna femoratum (Scudder)

Prior to the description of *Drepanopterna* in 1927 by Rehn this species was referred to *Aulocara* Scudder.

Aulocara elliotti (Thomas)

The only published record is that from the San Bernardino Ranch in Cochise County, by Snow in 1907. Springerville (E. D. Ball), Williams (B. B. Fulton), Baboquivari Mountains (R. H. Beamer).

Boopedon nubilum (Say)

1825. *G[ryllus] nubilus* Say, Jour. Acad. Nat. Sci. Phila., IV, p. 308. [♂, ♀; "Arkansa" near base of Rocky Mountains.]

1904. *Boopedon fuscum* Bruner, Biol. Cent.-Amer., Orth., II, p. 96. [Lectotype, ♂; Nogales, Arizona.]

Comparison of the type of *fuscum* in the author's collection with large Arizona series and with large series of undoubted *nubilum* from the Great Plains show that no features exist to warrant even racial recognition of *fuscum.* The species is variable in coloration and certain color phases which occur in Arizona are not found in material from the Great Plains. Such differences are, however, rarely constant even in the same series and certainly can not be given nominal recognition.

Morseiella flaviventris (Bruner)

Sabino Basin in Santa Catalina Mountains, Madera Canyon in Santa Rita Mountains, Flux in Alum Canyon, Sycamore Canyon in Patagonia Mountains, River Camp near Nogales, Nogales, south slopes of Atascosa Peak in Pajaritos Mountains, Bear Valley in Pajaritos Mountains, hilltop north of Montana Mine in Tumacacori Mountains, Oro Blanco, Espinosa Rancho in Altar Valley, Santa Margharita Rancho in Altar Valley, Sycamore Canyon in Baboquivari Mountains, Schaeffer Canyon

in Baboquivari Mountains, Mount Mildred in Baboquivari Mountains, (all Rehn and Hebard).

Ligurotettix coquilletti kunzei Caudell

Type locality—Phoenix. Rehn reduced *kunzei* to racial status in his revision of 1923. Bruner's record of *coquilletti* from Yuma in 1904 is baser on material of the present race.

OEDIPODINAE

Arphia aberrans Bruner in Caudell

Type locality—Hauchuca Mountains. Material from southern Arizona with wing-disk orange has been recorded as *Arphia teporata* Scudder.

Arphia conspersa Scudder (race of ?)

This insect has been recorded from Arizona as *Arphia arcta* Scudder, a synonym of *conspersa* occurring to the north; as *Arphia pseudonietana* (Thomas) from Jerome by Rehn, and as *Arphia townsendi* from the San Francisco Mountains by Bruner at the time he described that Mexican species.

Arphia pseudonietana pseudonietana (Thomas) (Atypical.)

Specimens from the base of the Chinarump Cliffs at 4400 feet, Pipe Springs at 4900 feet and the base of the Vermilion Cliffs at 5100 feet, taken in extreme northwestern Arizona by Rehn and Hebard, are very large and dark but are not as robust, have the organs of flight more caudate (particularly is less reduction shown in the female sex) and the caudal femora not as broad as in the series we here refer to *pseudonietana crassa*. We have very similar material from southern Nevada and southwestern Utah. Such material appears best recorded as atypical *p. pseudonietana*.

Arphia pseudonietana crassa Bruner

Type locality—southern Arizona.

After comparison of the type of *crassa* with very large series of *pseudonietana* from all portions of its very extensive range, we are convinced that *crassa* must at least be reduced to racial status. The insect differs from typical *pseudonietana* in having the caudal femora proportionately shorter and broader. Great individual variation occurs in both races, but in typical *crassa*

from Arizona the size averages larger, the form more robust, the organs of flight are very ample but average less caudate (this particularly noticeable in females), the general coloration is usually darker with pale proximal annulus of the caudal femora very weak or obsolete and the wing band is broader and spreads to include all of the wing tip.

A Mexican series before us, though in general appearance agreeing more closely with typical *pseudonietana,* is closer to the present race than we, in 1932, supposed.[4]

Encoptolophus pallidus pallidus Bruner

Quitobaquita (Rehn and Hebard), Wellton (M. J. Oosthuizen).

Encoptolophus pallidus subgracilis Caudell

Type locality—Phoenix. *Encoptolophus texensis* Bruner was placed as a synonym of *subgracilis* by Hebard in 1925. Bruner's record of *pallidus* from Tucson in 1905 is based on material of this insect.

Large series now available show that *subgracilis* is at best a poorly defined race of *pallidus.* It is the condition present over most of the very wide range of the species, typical *pallidus* being confined to the areas of extreme aridity from the Panamint and Death Valleys of California and the Amargosa Desert of Nevada south to the Mexican border and differs only in its decidedly more pallid coloration and proportionately larger head and eyes. These we believe are all responses to the extreme glare and heat of the region.

Encoptolophus sordidus costalis (Scudder)

Intergradation is so surely indicated by our series that we have finally, in 1934,[5] placed *costalis* as a race of *sordidus.*

Camnula pellucida (Scudder)

Hippiscus rugosus (Scudder)

Patagonia, Nogales (both E. D. Ball), south face of Atascosa Peak in Pajaritos Mountains at 5500 feet, south foothills of Pajaritos Mountains at 4400 feet (both Rehn and Hebard).

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[4] Trans. Amer. Ent. Soc., LVIII, p. 244.

[5] Ent. News, XLV, p. 104.

XANTHIPPUS Saussure, 1884

Scudder's "The Orthopteran Genus *Hippiscus*"[6] which appeared in 1892 is chaotic. Unfortunately Bruner in 1905 quoted as from Arizona a number of the names used by Scudder and it has therefore been necessary here to check up all of these Arizona references, with the following results.

Xanthippus corallipes corallipes (Haldeman)

1852. *Oedipoda corallipes* Haldeman, Stansbury's Exped. Great Salt Lake, p. 371, pl. 10, fig. 2. [♀, valley of Great Salt Lake.]

1892. *Hippiscus X[anthippus] eremitus* Scudder, Psyche, VI, p. 320. [♀, Arizona.]

1892. *Hippiscus X[anthippus] maculatus* Scudder[7] (in part), Psyche, VI, p. 334. [♀; Fort Grant, Arizona.] (Bruner's 1905 Arizona record is based on this specimen.)

1892. *Hippiscus X[anthippus] tigrinus* Scudder[8] (in part), Psyche, VI, p. 334. [♀; Fort Buchanan south of Tucson, Arizona.] (Bruner's 1905 Arizona record is based on this specimen which can not be located but very probably represents this race. It could otherwise only be *X. c. pantherinus* (Scudder).)

1892. *Hippiscus X[anthippus] paradoxus* Scudder, Psyche, VI, p. 335. [♀; Fort Whipple, Arizona and Arizona.]

Comparison of the dried alcoholic type of *eremitus* in the author's collection with large series of typical *corallipes* from Utah shows that no distinguishing characters exist to warrant the recognition of this name.

The Arizona specimens assigned to *paradoxus* also represent *corallipes corallipes*, as we believe will be found to be the case with the Utah material so described, from which a lectotype should be chosen.

Another synonym of *corallipes corallipes* is *Hippiscus Xanthippus conspicuus* Scudder, indicated in 1929 when Hebard selected as type the female from Silver City, New Mexico. That name was used by Snow in 1907 in reporting material from the Baboquivari Mountains.

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[6] The species there treated are referable to the genera *Hippiscus, Pardalophora, Xanthippus, Cratypedes, Sticthippus* and *Agymnastus.*

[7] Established as a synonym of *X. c. pantherinus* (Scudder) by Hebard in 1929.

[8] Established as a synonym of *Pardalophora haldemanii* (Scudder) by Hebard in 1925.

Prior records of *corallipes* from Arizona are all referable to this or the following race.

Xanthippus corallipes pantherinus (Scudder)

If distinguishable at all, this race of the Great Plains is very close to *corallipes corallipes*. Typical material is before us from Douglas (F. H. Snow) and the Huachuca Mountains (R. H. Beamer, Jr).

Xanthippus corallipes leprosus Saussure

1884. *X[anthippus] leprosus* Saussure, Prodr. Oedipod., p. 92. [♂ ♀; [Taos Valley at about 7000 feet],[9] New Mexico.]

1892. *Hippiscus X[anthippus] albulus* Scudder, Psyche, VI, p. 350. [♂, ♀; Prescott mountain district, Arizona.]

Comparison of topotypic material of *albulus* with topotypic material taken at the same time as the type of *leprosus* shows that the latter must be placed as an absolute synonym.

This race occupies a position between *X. c. altivolus* Scudder, the response to the highest elevations at which the species can exist, and the races developed at low elevations. In both cases local variation is often decided and intergrades are apparently frequent.

The only typical material of the present race from Arizona before us is part of the series from Prescott and the Hualapai Mountains. Two females from Prescott show a tendency toward *X. c. cupidus* Scudder as does a female from Jerome which was recorded as *Hippiscus cupidus* by Rehn in 1904. A tendency toward *X. c. altivolus* is shown to different degrees by material from twelve miles north of DeMotte Park on the Kaibab Plateau and Williams.

Xanthippus corallipes altivolus Scudder

In 1925 we believed that *pumilus* Scudder could be recognized as a race of *corallipes*, but further investigation showed it to be a synonym of *altivolus* and it was so assigned by us in 1929. A male paratype of *pumilus* from Fort Grant, Arizona, was again the basis for that name being reported from "Arizona" by Bruner in 1905.

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[9] Ascertained by the author through examination of the types in the Geneva Museum.

Our concept of *altivolus* in 1925 was further incorrect in that, though the material from "the Mountains of New Mexico and Colorado" at high elevations is properly referred to that race, material from lower elevations in those States is frequently representative of *X. c. leprosus* Saussure and the material assigned to *altivolus* from the Great Plains of Colorado represents instead *X. c. latefasciatus* Scudder (as recorded by us in 1929 when we unfortunately overlooked and so did not correct that error).

The following Arizona material of *corallipes altivolus* is before us. San Francisco Mountains at 9200 to 10000 feet (Rehn and Hebard), Mount Graham (H. G. Holt), "Fort Grant" (probably from the adjacent mountains), Mount Lemmon in the Santa Catalina Mountains at 7500 to 9150 feet (E. D. Ball; C. T. Vorhies; J. R. Slevin), Santa Catalina Mountains at 8500 feet (A. A. Nichol), Oracle (E. R. Tinkham).

Xanthippus corallipes cupidus Scudder

Type locality—Pinal Mountains. The female type upon which this name is based shows clearly that a race of *corallipes* is represented. This specimen is far larger than is normal in *altivolus* but two topotypic females, recorded as *Hippiscus leprosus* by Caudell in 1901, are not quite as large. Intergradation is also shown with *X. c. leprosus* Saussure by the Prescott series mentioned above. It is evident that much more material from the Pinal Mountains is needed before the validity of *cupidus* as even a race can be definitely established.

Xanthippus affrictus Scudder

Type locality — Yuma. Two females, one of which was designated lectotype by Hebard in 1929, are labelled "Yuma, Arizona, (C. F. Wickham)". These remain the only specimens known of an apparently distinctive species,[10] the nearest relatives of which occur far north in the Great Basin and the northwest. We do not feel comfortable as to the locality. A number of efforts to find more material of the genus about Yuma have all met with failure, but sufficient search has not been made in the

[10] Of the other material originally referred to *affrictus*, that from Montana and Dakota represents *X. corallipes latefasciatus* Scudder, while that from Colorado represents *X. corallipes leprosus* Saussure.

Spring and it is probable that, if the genus occurs there, adult individuals will be present only during that season and in greatly reduced numbers in the early Summer.

Cratypedes neglectus (Thomas)

Previously recorded from "Arizona" we have material from the North Rim of the Grand Canyon on the Kaibab Plateau and from Bright Angel Point on the Coconino Plateau.

Leprus cyaneus Cockerell (Atypical.)

This insect is shown by material before us to be typical southwestward as far as Fort Wingate and Oscuro, New Mexico, and we believe that it will be found typical in northeastern Arizona though no specimens of the genus have as yet been taken there.

To the south, from the Hachita Grande Mountains of New Mexico to Snyder's Hill and the Tumacacori Mountains of Arizona a condition is present which is atypical in its average larger size and heavier form, with tegmina more maculate and the pale area often wider. Such material from Carr Canyon in the Huachuca Mountains was recorded as *L. glaucipennis* Scudder by Rehn in 1907.

From the Baboquivari Mountains westward our series are even more aberrant in differing from the typical not only as noted above but also in having the wing disk decidedly paler. A male of this phase or race was recorded as *glaucipennis* from Hermosillo, Sonora, by Bruner in 1905.

Detailed revisionary study can alone determine whether phases or races are represented.

Leprus glaucipennis Scudder (Atypical.)

This species appears to occur typical only west of the Sierra Nevada and the major mountain ranges to the south on the Pacific Coast and material is before us from San Luis Obispo, California, to San Esteban, Baja California.

Material from southeastern California and southern Nevada appears to be atypical of this insect. Still more atypical are specimens before us from Kingman, Sawmill Canyon in the Hualapai Mountains, Broncho Canyon of the Black River and Prescott, Arizona.

Leprus robustus Hebard

Type locality—San Bernardino Ranch, Cochise County.

Tropidolophus formosus (Say)

Reported simply as from " Arizona " by Bruner in 1905. Paradise (O. C. Poling), Chiricahua Mountains, Douglas (J. A. G. Rehn).

Dissosteira carolina (Linnaeus)

Spharagemon collare (Scudder)

Snow reported material as *Spharagemon collare* var. *angustipenne* Morse from the San Bernardino Ranch in Cochise County in 1907. That name was described as a race from Utah by Morse in 1895 and we believe will prove to be a synonym, as indicated by Kirby in 1910 who, however, did not employ trinomials.

Scirtetica ritensis Rehn

Type locality—Santa Rita Mountains.

Lactista oslari Caudell

Type locality—Nogales.

Platylactista aztecus (Saussure)

Referred to *Lactista* prior to the description of *Platylactista* by Hebard in 1932.

Tomonotus ferruginosus Bruner in Caudell

Type locality—Fort Grant. Given in error as *ferrugineus* by Snow in 1907.

Derotmema haydenii haydenii (Thomas) (Atypical.)

Recorded as *haydenii* from Williams.

Derotmema haydenii laticinctum Scudder

Reduced to racial status by Rehn in 1919.

Derotmema delicatulum Scudder

Has been twice recorded as *delicatum* in error. Bruner's record of *Derotmema saussureanum* Scudder from southwestern Arizona in 1905 was based on mislabelled material. That species does not occur anywhere east of the California mountains.

Trepidulus rosaceus (Scudder)

Originally referred to *Mestobregma*, McNeill erected the genus *Trepidulus* in 1901. That year Caudell described *Araeopteryx penelope*, a synonym established by Rehn in 1904. Described in 1900 from Tehachapi and Palm Springs, California, and Yuma, Arizona, we here select the type locality of *rosaceus* as the latter locality.

Rehnita gracilipes (Caudell)

Type locality—Nogales. Arizona specimens have been recorded as *Trepidulus melleolus* (Scudder).

Trachyrhachis kiowa kiowa (Thomas)

Material atypical of this race was recorded from Williams as *Mestobregma obliterata* Bruner,[11] a synonym of *Trachyrhachis kiowa thomasi* (Caudell) established by Hebard in 1931.

Trachyrhachis mexicana (Saussure)

The synonym *townsendi* Bruner was established by Hebard in 1932. Benson, Oracle, Santa Catalina Mountains below 3000 feet, lower Madera Canyon in Santa Rita Mountains, Santa Rita Mountains at 4000 feet, foothills of Pajaritos Mountains, Tucson, Tumamoc Hill in Tucson Mountains, Sonora Road Canyon in Tucson Mountains, Snyder's Hill, Sahuaro plain west of Tucson Mountains, Espinosa Rancho in Altar Valley, Palo Alto Rancho in Altar Valley, Santa Margharita Rancho in Altar Valley, Coyote Mountains below 4000 feet, Sycamore Canyon in Baboquivari Mountains, Fortification Rock in Baboquivari Valley (Rehn and Hebard, except Oracle, E. R. Tinkham).

Trachyrhachis coronata Scudder

Springerville (E. D. Ball).

Metator pardalinus (Saussure)

Mestobregma terricolor Rehn

Mestobregma impexum Rehn

Base of Vermillion Cliffs fifteen miles north of Pipe Springs in Coconino County (Rehn and Hebard).

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[11] Not to be confused with *Oedipoda obliterata* Thomas, 1880.

Mestobregma plattei rubripenne (Bruner)

Type locality — Oracle. Previous Arizona records of both names as species are referable to this southwestern race. The name was reduced to racial status by Rehn in 1919.

Conozoa sulcifrons sulcifrons (Scudder)

This race was recorded as *behrensi* Saussure from Phoenix by Caudell in 1902 and by Rehn in 1907, as *acuminata* Scudder ? by Rehn in 1907 and from " Arizona " by Essig in 1926.

Conozoa sulcifrons acuminata Scudder

The racial status of this name was first indicated by Rehn in Hebard in 1929. Of the males recorded as *acuminata* ? by Rehn in 1904 from Florence, one appears to be typical, the other near *sulcifrons sulcifrons*. A male from Winslow is before us.

Conozoa carinata Rehn

Type locality—Carr Canyon in Huachuca Mountains. This species was recorded from Nogales and the Huachuca Mountains by Caudell in 1905 and from the Baboquivari Mountains and Tucson by Snow in 1907 as *sulcifrons*.

Trimerotropis cristata McNeill

Tinajas Altas (E. D. Ball), Wellton (J. C. Bradley).

Trimerotropis bilobata Rehn and Hebard

Holbrook (J. A. G. Rehn), Springerville (E. D. Ball).

Trimerotropis sparsa (Thomas)

Fredonia (Rehn and Hebard).

Trimerotropis pallidipennis pallidipennis (Burmeister)

Recorded from Arizona as *Trimerotropis vinculata* Scudder, established as a synonym by Hebard in 1925. A teneral male from Williams was also recorded as *modesta* by Rehn and Hebard in 1908.

Trimerotropis strenua McNeill

A specimen from Nogales was recorded as *fascicula* by Rehn and Hebard in 1908.

Trimerotropis pistrinaria Saussure (race of ?)

Osborn, Douglas (both Rehn and Hebard).

Trimerotropis campestris McNeill

Specimens from Williams and near Bright Angel, Coconino Plateau, were recorded as *modesta* by Rehn and Hebard in 1908.

Trimerotropis magnifica Rehn

Type locality—Carr Canyon in Huachuca Mountains.

Trimerotropis latifasciata Scudder

1881. *Trimerotropis latifasciata* Scudder, 2d Rept. U. S. Ent. Comm., App. II, p. 26. [♀: Wallula, Washington; Lake Point, Utah.]

1905. *Trimerotropis snowi* Rehn, Trans. Kansas Acad. Sci., XIX, p. 223. [♀; Congress Junction, Arizona.]

Through the great kindness of the authorities of the University of Kansas the unique type of *Trimerotropis snowi* is now before us. It agrees very closely with material of *latifasciata* before us from Utah and Nevada and we place *snowi* without hesitation in the present synonymy.

This specimen is very large and robust, agreeing in these respects with material of this group from the southern Great Plains (*laticincta* Saussure) and from southern Arizona. It is, however, even heavier with broader tegmina which are more tessellate and have their bands more broken, in appearance more grayish brown with wing band near the maximum found in *laticincta* (maximum width of wing band near taenia 14., width including taenia 16.3 mm.). The material before us from southern Arizona is, on the other hand, sometimes quite as heavy, with equally wide tegmina but more like Great Plains material in the less tessellate tegmina with bands less broken, however the wing band in those specimens varies from narrower to very decidedly wider and the general coloration is darker and more reddish brown than in any others. Whether these three phases may be distinguished as races can not be determined without a general detailed revision of this difficult group, taking into consideration all material available from Mexico as well as from the United States.

Material from the San Bernardino Ranch in Cochise County and Flagstaff was recorded as *laticincta* by Snow in 1907.

Trimerotropis melanoptera McNeill

Trimerotropis inconspicua Bruner

Trimerotropis cincta (Thomas)

We are satisfied that *Trimerotropis tessellata* McNeill, described from Turkey Tanks in 1901, is a synonym. That name was placed in the synonymy of *Trimerotropis caeruleipes* Scudder by Caudell in 1902, which was in turn placed as a synonym of *Trimerotropis fontana* (Thomas) by Hebard in 1928. The relationship between *cincta* and *fontana* is very close. Lupton, north rim of Grand Canyon and Jacobs Lake on Kaibab Plateau, Ash Fork (Ball; Tinkham).

Trimerotropis tolteca modesta Bruner

Trimerotropis alliciens (Scudder) was placed as a synonym and *modesta* was given racial status under *tolteca* by Hebard in 1932.[12] It is probable that the specimens from " Arizona or New Mexico " described as *Trimerotropis fascicula* by McNeill in 1901, now known to have been destroyed, were referable to this insect, material of which from the Huachuca Mountains, Baboquivari Mountains, Humphreys Peak and Oak Creek Canyon has been recorded as *fascicula* and from the Huachuca Mountains as *Trimerotropis bruneri* McNeill.

Trimerotropis cyaneipennis Bruner

Recorded as " *Trimerotropis cyaneipes* Bruner " in error from Huachuca Mountains by Caudell in 1905.

Trimerotropis suffusa Scudder

VT Ranch and Dry Park on Kaibab Plateau (both D. I. Rasmussen), Jacobs Lake on Kaibab Plateau (E. R. Tinkham), San Francisco Mountains (E. R. Tinkham), Humphreys Peak (F. H. Snow), Flagstaff (R. H. Beamer), Mormon Lake (E. D. Ball), Oak Creek Canyon (F. H. Snow).

Hadrotettix trifasciatus (Say)

Circotettix rabula rabula Rehn and Hebard (slightly atypical toward *rabula altior*)

Kaibab Plateau (E. D. Ball).

Circotettix rabula altior Rehn

White Mountains eight miles west of Springerville at 9300 to 9400 feet (E. R. Tinkham).

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[12] Trans. Amer. Ent. Soc., LVIII, p. 260.

Circotettix coconino Rehn

Prior Arizona records of *Circotettix undulatus* (Thomas) were referred to this species by its describer in 1921. Type locality—Bill Williams Mountain.

Anconia integra Scudder

Coniana snowi Caudell

Type locality—Bill Williams Fork. Previously recorded from that locality as *Heliastus minimus* Scudder by Rehn in 1905 and Snow in 1907.

Heliastus parviceps (F. Walker)

Heliastus aridus (Bruner) was established as a synonym by Hebard in 1931.[18]

Heliastus benjamini Caudell

Type locality—Huachuca Mountains.

Xeracris minimus (Scudder)

Blaisdell at 188 feet (M. Hebard).

Heliaula rufa (Scudder)

Referred to *Aulocara* prior to the description of *Heliaula* by Caudell in 1915.

BATRACHOTETRIGINAE

Brachystola magna (Girard)

Brachystola intermedia Bruner was placed as a synonym by Hebard in 1929.

Phrynotettix tschivavensis (Haldeman)

Phrynotettix magnus (Thomas) was placed as a synonym by Rehn in 1903, this endorsed by Hebard in 1932 at which time *Phrynotettix verrucullatus* (Uhler) was placed as another synonym.

As *Phrynotettix robustus* (Bruner) occurs only in western Texas and eastern New Mexico it is evident that "southwestern Arizona" given by Bruner was due to an error in labelling.

[18] Trans. Amer. Ent. Soc., LVII, p. 120.

PYRGOMORPHINAE

Tytthotyle maculata Bruner

The Pyrgomorphinae are not represented in Arizona. The type of *Calamacris oculata* Bruner was labelled in error "southern Arizona". That name was placed as a synonym of *Icthiacris mexicana* (Bruner) by Hebard in 1932, a species peculiar to Baja California.

CYRTACANTHACRINAE

Bruner's record of *Dracotettix californicus* Bruner from "southern Arizona", published in 1907, is based on mislabelled specimens of *Dracotettix monstrosus monstrosus* Bruner, a species which does not occur east of the California mountains.

Taeniopoda eques (Burmeister)

Material of this species from Arizona was referred to *Taeniopoda picticornis* (Walker) prior to the author's revision of the genus in 1925.

Leptysma marginicollis (Serville)

Paropomala wyomingensis (Thomas)

The synonymy of *cylindrica* (Bruner) was established by Rehn and Hebard in 1906, but Snow so recorded material from the San Bernardino Ranch in 1907.

Prorocorypha snowi Rehn

Type locality—Santa Rita Mountains.

As *Eremiacris virgata* (Scudder) has been taken by us southwest as far as Lordsburg, New Mexico, the species will almost certainly be found in extreme southeastern Arizona.

Eremiacris pallida (Bruner)

1904. *Paropomala pallida* Bruner, Biol. Cent.-Amer., Orth., II, p. 40. [♀; Indio, California.]

1904. *Paropomala dissimilis* Bruner, Biol. Cent.-Amer., Orth., II, p. 41. [♀, "southern Arizona, California or northern Mexico".]

1908. *Paropomala perpallida* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., LX, p. 373, figs. 5 and 6. [♂, near Bright Angel Trail in Grand Canyon of the Colorado at 3750 feet, Arizona.]

Large series before us compared with the types, all in the author's collection, prove the synonymy indicated above. The name *perpallida* was based merely on a decidedly depauperate specimen.

All records of *Paropomala virgata* Scudder from Arizona were based on material of this species.

Eremiacris acris Rehn and Hebard

Type locality—Railroad Pass in Cochise County.

Clematodes larreae Scudder

Six miles north of Ajo, Ajo (both Rehn and Hebard).

Schistocerca vaga vaga (Scudder)

Arizona records of *vaga, vega* and *Schistocerca carinata* Scudder were based on material of this race.

Schistocerca shoshone (Thomas)

1873. *A*[*cridium*] *shoshone* Thomas, Proc. Acad. Nat. Sci. Phila., p. 296. [♂, ♀; southeastern Nevada and southwestern Utah.]

1899. *Schistocerca venusta* Scudder, Proc. Amer. Acad. Arts and Sci., XXXI, p. 467. [Lectotype, ♂; Indio, California.]

We have long believed that *venusta* represented nothing more than a vittate color phase of *shoshone*. Rehn and Hebard selected the lectotype in 1912. This specimen, compared with very large series, bears out our opinion fully. In the West, however, a shorter, smaller vittate insect occurs in the forested mountains. To it the name *venusta* has been frequently applied, but we are far from convinced that it is the same as *shoshone*. Detailed revision is necessary, however, to determine whether a distinct species, a race, or merely a striking environmental adaptation is represented.

Schistocerca sp. (See above.)

Has been recorded from Carr Canyon in Huachuca Mountains as *Schistocerca venusta* Scudder, and from the Grand Canyon as *Schistocerca albolineata* (Thomas).

Schistocerca lineata Scudder

Nogales (E. D. Ball).

Schistocerca albolineata (Thomas)

Type locality—probably Arizona.

Conalcaea coyotero Hebard

Type locality—Prescott. Bruner in 1908 recorded material of this species from Phoenix as *Conalcaea neomexicana* Scudder.

Conalcaea huachucana Rehn

Type locality—Carr Canyon in Huachuca Mountains.

Conalcaea humphreysii (Thomas)

1875. *Pexotettix humphreysii* Thomas, Rept. Geol. Expl. West of 100th Merid., v, p. 890, pl. 45, figs. 1 and 2. [♂, ♀; southern Arizona.]
1897. *Conalcaea neomexicana* Scudder, Proc. U. S. Nat. Mus., xx, p. 26, pl. 11, fig. 9. [♂; Silver City, New Mexico.]
1897. *Melanoplus humphreysii* Scudder, Proc. U. S. Nat. Mus., xx, p. 206. [♀, Arizona.]
1908. *Barytettix borealis* Caudell, Proc. Ent. Soc. Wash., ix, p. 69. [♂, base of Santa Catalina Mountains, Arizona; ♀, no data.]

In 1879 males sent Scudder by Thomas as *humphreysii* were representative of *Melanoplus aridus* (Scudder). From that time the former author failed to recognize correctly the male sex of the present species and in 1897 described the only male before him as the synonym *Conalcaea neomexicana,* though he placed the single female which he had correctly as to species but not as to genus.

Caudell's later synonym was probably due to his following Scudder's misleading key, where the unstable character of the width of the mesosternal lobes resulted in *Conalcaea* being placed in section c^1 and the synonymous *Barytettix* in section c^2. Comparison with the original description and figures of either of the earlier names should have prevented this.

Aeoloplus tenuipennis Scudder

1897. *Aeoloplus tenuipennis* Scudder, Proc. U. S. Nat. Mus., xx, p 70, pl. 5, fig. 5. [♂; Fort Grant, Arizona.]
1897. *Aeloplus uniformis* Scudder (♂ lectotype, possibly not ♀), Proc. U. S. Nat. Mus., xx, p. 77, pl. 6, fig. 2. [♂; Fort Whipple, Arizona.]
1897. *Aeoloplus arizonensis* Scudder, Proc. U. S. Nat. Mus., xx, p. 78, pl. 6, fig. 3. [♂, ♀; Mojave Desert, [California].]
1897. *Aeoloplus oculatus* Scudder, Proc. U. S. Nat. Mus., xx, p. 79, pl. 6, fig. 4. [♂; Mojave, California (not Arizona).]

The complex here encountered is a most difficult one. Very large series before us show that it represents one of the most plastic species found in the arid southwest. In different types of environment some extremely different conditions occur, but these

are, we believe, all no more than topomorphs (at least as far as Arizona is concerned), produced largely if not entirely by the insects living in and feeding upon certain plants. The types upon which the present synonymy is based are all, however, very similar, *arizonensis* alone being based on an optimum condition locally present in great numbers on the Mojave Desert. Even without the great variation shown by our series, we would be satisfied that not even racial status could be given that name. We have already given this genus much study but we do not feel that publication of a complete analysis can yet be given. Suffice it to say that in Arizona the only recognizable long-winged species of the genus is *tenuipennis*.

Bruner in 1908 referred material of this species from southern Arizona to *Aeoloplus plagosus* Scudder.

Aeoloplus chenopodii (Bruner)

Lupton, St. John, Painted Desert (all E. D. Ball).

Though *Oedaleonotus enigma* (Scudder) was recorded from Sonora, Mexico, by Bruner in 1908 and there is a possibility that it occurs in extreme western Arizona, we do not consider Essig (1926) justified in including this State in its distribution. Eastern limits from material before us are Dry Falls and Pasco, Washington; Shoshone, Idaho; Carlin, Nevada, and Tehachapi and El Centro in the Imperial Valley, California.

Oedaleonotus borckii orientis Hebard

Kaibab Plateau, Lupton (all E. D. Ball).

Hesperotettix curtipennis Scudder

Hesperotettix viridis nevadensis Morse

Northwest slope of Kaibab Plateau (Rehn and Hebard), Kaibab Plateau (E. D. Ball).

Hesperotettix viridis viridis (Thomas)

1872. *C[aloptenus] viridis* Thomas, Prelim. Rept. U. S. Geol. Surv. Montana and Terr., 5th Rept., p. 450, pl. 11, fig. 3 [♂, ♀: Colorado; Wyoming; Kansas.]

1897. *Hesperotettix festivus* Scudder, Proc. U. S. Nat. Mus., xx, p. 60, pl. 4, fig. 10. [Lectotype, ♂; Salt Lake Valley, Utah.]

In 1931 we placed *festivus* as a race of *viridis*. Many problems are found in the study of this extremely plastic species and the enormous series at hand show that a multiplicity of color phases are developed. It is true that in the Great Basin and Southwest all material referred to *festivus* has the pronotal sulci immaculate, not finely but definitely defined in black or brown as is the case for material from the Great Plains which has been recognized as *viridis*. This is, however, the only difference we can find, and variable in itself in typical *viridis*, it does not justify recognition of *festivus*. It would seem that on certain plants the species often assumes quite different appearing phases and we are not yet prepared to say whether or not any of these deserve nominal recognition.

Rehn recorded as *Melanoplus altitudinum* (Scudder) specimens of *Melanoplus dodgei* (Thomas) from Prescott and Copper Basin, Arizona. We now know that this material was mislabelled, actually coming from Colorado.

Melanoplus chiricahuae Hebard

Type locality—Ida's Peak in Chiricahua Mountains at 8000 feet.

Melanoplus femur-nigrum Scudder

Type locality—San Francisco Mountains.

Melanoplus snowii Scudder

Melanoplus truncatus Scudder

Type locality—San Francisco Mountains.

Melanoplus aridus (Scudder)

Type locality, here selected; San Carlos, Arizona. This species was described from five specimens; a pair from "Arizona and San Carlos", one female from Fort Whipple and two females from Fort Buchanan, Arizona. The pair were from a Wheeler Expedition and were sent to Scudder by Thomas. These were originally incorrectly supposed by Scudder to be part of that

author's original series of *Pezotettix humphreysii* Thomas. This pair disappeared before 1897, but two females also from the Wheeler Expedition and labelled respectively "Arizona; Wheeler" and "San Carlos; Wheeler" are in the National Museum collection. All of these specimens except the lost pair have been studied; all represent *aridus* and we are convinced that all of the original material represented the same species and feel justified in designating the above type locality.

Melanoplus desultorius desultorius Rehn

Type locality—Carr Canyon in Huachuca Mountains.

Melanoplus franciscanus Scudder

Type locality—San Francisco Mountains.

Melanoplus splendidus Hebard

Coconino Plateau fifteen miles east of Flagstaff (E. D. Ball).

Scudder recorded a specimen of his *Melanoplus arboreus,* taken by Schaupp, as from Arizona. The specimen was evidently mislabelled. The insect is a race of *punctulatus* which does not occur west of central Texas, in which state all of Schaupp's collecting was done.

Melanoplus yarrowii (Thomas)

"On Wheeler Expedition". *Melanoplus olivaceous* Scudder was placed as a synonym by Hebard in 1929.

Melanoplus thomasi Scudder

Melanoplus bivittatus (Say)

Alpine, St. John, Springerville, Chino Valley, Aubrey Valley, Williamson Valley, Prescott, all 7000 to 9000 feet (all E. D. Ball).

Melanoplus differentialis (Thomas)

Melanoplus gladstoni (Scudder)

A robust condition, common locally in southern Arizona, has been reported from there as *Melanoplus corpulentus* Scudder, placed in the present synonymy by Hebard in 1929.

Melanoplus regalis (Dodge)

A very striking optimum condition is common locally in southeastern Arizona, described as *Melanoplus picturatus* Bruner, synonymized by Hebard in 1929.

Melanoplus femur-rubrum femur-rubrum (DeGeer)

A specimen of *Melanoplus confusus* Scudder, recorded as the preoccupied name *Melanoplus minor* (Scudder) was reported from Prescott by Rehn in 1904, which specimen actually came from Colorado.

Melanoplus lakinus (Scudder)

Melanoplus sonorae Scudder was established as a synonym by Hebard in 1917.

Melanoplus occidentalis occidentalis (Thomas)

Synonyms are *Melanoplus cuneatus* Scudder established by Caudell in 1903 and *Melanoplus flabellifer* Scudder established by Hebard in 1925.

Melanoplus mexicanus mexicanus (Saussure)

Melanoplus atlanis (Riley) is a synonym established by Hebard in 1928. Caudell's 1903 record of *Melanoplus devastator* Scudder from Phoenix is based on a female of the present species. This record led to the inclusion of "Arizona" in the range of *devastator* as given by Essig in 1926, though that species actually does not occur in this State. The species was also recorded from Tucson and the Baboquivari Mountains as *spretus* Uhler in 1907, (*spretus* (Walsh) is the migratory phase of *mexicanus*).

Melanoplus packardii Scudder

Ten miles east of Flagstaff (E. R. Tinkham), Williams (B. B. Fulton), Prescott (O. C. Poling), Dewey (O. C. Poling), Mount Trydal (J. A. Kusche).

Melanoplus foedus foedus Scudder

St. John (E. D. Ball), Springerville (E. D. Ball), Coconino Plateau (R. H. Beamer).

Melanoplus angustipennis (Dodge)

Melanoplus arizonae Scudder

Type locality—Arizona. *Melanoplus palmeri* is a synonym, established by Hebard in 1929.

Melanoplus herbaceus Bruner

1893. *Melanoplus herbaceus* Bruner, Div. Ent. U. S. Dept. Agr., Bull. No. 28, p. 25, figs. 13 a and b. [♂, ♀; El Paso, Texas.]

1897. *Melanoplus flavescens* Scudder, Proc. U. S. Nat. Mus., xx, p. 155, pl. 11, fig. 1. [♂; San Diego, California.]

1902. *Melanoplus brownii* Caudell, Can. Ent., xxxiv, p. 169. [♂, ♀; few miles up Colorado River from Yuma, Arizona.]

Study of the types and large series now available from intermediate points proves conclusively the present synonymy. The differences noted by Scudder for *flavescens* are by no means as decided as might be supposed from his comparative analysis and are all attributable to individual variation. Rehn had placed *flavescens* as a race of *herbaceus* in 1907.

Without examining the original series we have for a long time considered *brownii* to be a slender dull-colored race of *M. pictus* Scudder,[14] occurring in the lowlands of Arizona, individuals of which are remarkably similar to individuals of the brown color phase of *herbaceus* sometimes found with them, differing actually only very slightly in coloration but strikingly in the male furcula and cerci. The original series of *brownii* proves that the name was based on merely the brown color phase of *herbaceus*, the original series of *herbaceus* being all of the green color phase, and *brownii* must consequently fall as a synonym.

Melanoplus pictus Scudder

The name *pictus* must be used for the slender and not strikingly colored insect, common locally in the lowlands of Arizona, which Rehn recorded from Florence as *brownii* in 1908 and which we have since repeatedly recorded as *brownii* or *pictus brownii*. We have here placed *brownii* as a synonym of *M. herbaceus* Bruner, the brown color phase of that species being very similar indeed in general appearance to the normal for the present insect. The

[14] Such material was unfortunately reported as *pictus brownii* by Hebard in 1929.

type of *pictus* is very different in appearance being much larger and rich brown strikingly marked with yellow. This male is the only specimen we have seen from the Bradshaw Mountains. From study of very large series of this and allied species, however, we have decided that the specimen represents merely an unusually striking chromatomorph and that it would not be safe to recognize races from the material available.

This species is much more closely related to *M. bowditchi* Scudder than we had supposed.

Material has been recorded from the San Bernardino Ranch, Palmerlee, the Huachuca Mountains, Oak Creek Canyon, Florence and Phoenix as *M. flavidus* Scudder, from the Baboquivari Mountains Tucson and Florence as *M. brownii* Caudell, from Tucson as *M. canonicus* Bruner.

Melanoplus bowditchi Scudder (Atypical.)

Specimens from Lupton and St. John, taken by E. D. Ball, are before us. They are very similar to those from the upper valley of the Rio Grande in New Mexico which we have this year already recorded. Although it is probable that an undescribed geographic race is represented, we find the variation in this and allied species so great that we believe it advisable to await publication of a revision where the relationship, races and individual variations of *bowditchi* and its allies can be fully discussed and compared.

Melanoplus bowditchi Scudder (Atypical.)

Williams (Barber and Schwartz), Oak Creek Canyon (F. H. Snow), Glenn Oaks (E. D. Ball), Prescott (Poling; Kusche; Beamer), Battle Mountain near Prescott, Granite Peak near Prescott, Mount Trydal near Prescott (all J. A. Kusche) and Cherry Creek in Black Hills (O. C. Poling).

This series is very different in appearance from those from Lupton and St. John and are nearest the specimens we recorded from Austin Bluffs, Colorado, as atypical of *bowditchi canus* at the time we described that race.

If, as we believe, these specimens represent a race of *bowditchi*, very surprising convergence toward *M. complanatipes canonicus*

Scudder is shown when it is realized how very distinct not only in appearance but also in male genitalic development are the typical races of *bowditchi* and *complanatipes*.

Caudell in 1903 recorded the male from Williams as *bowditchi*.

Melanoplus complanatipes complanatipes Scudder

Beaver Dam (Rehn and Hebard), base of Chinarump Cliffs seven miles west of Fredonia (Rehn and Hebard), Pipe Springs (Rehn and Hebard), Kingman (O. C. Poling), Yuma (Rehn and Hebard).

Melanoplus complanatipes canonicus Scudder

Type locality — Grand Canyon of the Colorado. We have studied our large series from the southwestern United States referable to *complanatipes* (lectotype from Cape St. Lucas, Baja California) and find that *canonicus* can not be considered a distinct species but represents a geographic race which in Arizona is known only from the south margin of the Grand Canyon but which has a very extensive distribution to the north. Both this and the typical race are subject to extreme individual as well as striking geographic variation.

Bradynotes kaibab Hebard

Twelve miles north of De Motte Park on Kaibab Plateau at 8500 feet (M. Hebard), VT Ranch on Kaibab Plateau at 7900 feet (E. D. Ball).

Phoetaliotes nebrascensis (Thomas)

Poecilotettix pantherinus (F. Walker)

Poecilotettix sanguineus Scudder

Perixerus gloriosus Hebard

Type locality — South slopes of Atascosa Peak, Pajaritos Mountains.

Dactylotum variegatum (Scudder)

Recorded as *Dactylotum pictum* (Thomas) from the Baboquivari Mountains by Snow in 1907.

TETTIGONIIDAE

PHANEROPTERINAE

Dichopetala brevihastata Morse

Insara elegans elegans (Scudder)

Recorded frequently as *Hormilia elegans* Scudder, Kirby placed *Hormilia* as a synonym of *Insara* in 1906.

Insara elegans consuetipes (Scudder)

Referred to *Arethaea* until Rehn and Hebard's revision of 1914 at which time *consuetipes* was reduced to geographic racial status.

Insara apache (Rehn)

Type locality—Carr Canyon in Huachuca Mountains. Referred to *Hormilia* until Rehn and Hebard's revision of 1914.

Insara covilleae Rehn and Hebard

Type locality—Tumamoc Hill in Tucson Mountains.

Insara tessellata Hebard

Type locality—Wheeler Canyon, Hualapai Mountains.

Arethaea coyotero Hebard

Type locality—Prescott.

Arethaea gracilipes papago Hebard

Type locality—Growler Valley, south of Growler Pass.

Arethaea gracilipes gracilipes (Thomas)

Western limits of this race as shown by males before us are Jemez Hot Springs, Bent and the White Sands of New Mexico. It appears probable, therefore, that it occurs in northeastern Arizona and Thomas' 1872 record of *gracilipes* from Arizona may be correct. The female from Pine, Arizona, recorded as typical *gracilipes* by Rehn and Hebard in 1914 can not be determined as to race as no males are known from that region.

Arethaea sellata Rehn

Type locality—Palmerlee.

Arethaea carita Scudder

Arethaea polingi Hebard

Type locality—Prescott.

Arethaea brevicauda (Scudder)

Boulder Springs near Kingman, (O. C. Poling).

Scudderia furcata furcifera Scudder (Atypical.)

Rehn and Hebard reduced *furcifera* to racial status in 1914.

Scudderia mexicana (Saussure)

Amblycorypha insolita Rehn and Hebard

Arizona material of this species was referred to *Amblycorypha huasteca* (Saussure) prior to its description in 1914.

Microcentrum californicum Hebard

One male of this species from Nogales was recorded as *Microcentrum retinerve* (Burmeister), a very distinct southeastern species, by Caudell in 1905, which resulted in Essig giving "Arizona" for that insect in 1926. Paradise (O. C. Poling), upper and lower Madera Canyon in Santa Rita Mountains (M. Hebard), Oracle (E. R. Tinkham), Kits Peak rincon in Baboquivari Mountains (J. A. G. Rehn), Kingman (O. C. Poling).

Microcentrum rhombifolium (Saussure)

Arizona records of *Microcentrum laurifolium* (Linnaeus) all apply to the present species. Rehn and Hebard corrected the misuse of that name in 1908, pointing out that it applied to a South American species of the genus *Stilpnochlora.* All but one of Caudell's series from Nogales, referred to *Microcentrum retinerve,* are representative of the present species.

COPIPHORINAE

Neoconocephalus triops (Linnaeus)

Arizona material of this species has been referred to *Conocephalus mexicanus* Saussure and *Conocephalus fuscostriatus* Redtenbacher, which names were placed in the present synonymy by Rehn and Hebard in 1915.

CONOCEPHALINAE

Orchelimum concinnum delicatum Bruner

River Camp near Nogales (Rehn and Hebard), Nogales (E. D. Ball).

Orchelimum unispina (Saussure and Pictet)

Eastern slope of Baboquivari Mountains seven miles north of the Mexican border (E. D. Ball).

Conocephalus fasciatus vicinus (Morse)

Arizona material was referred to *Xiphidion fasciatum* (DeGeer) prior to the revision of the genus by Rehn and Hebard in 1915.

Conocephalus strictus (Scudder)

DECTICINAE

In 1899 Scudder recorded *Tropizaspis steindachneri* (Hermann) from El Paso, Texas and Nebraska but suggested that the latter was due to incorrect labelling. In 1907 Caudell repeated these comments, assigning *Arytropteris steindachneri* Hermann to synonymy under *Neduba carinata* (Walker), which has apparently led Essig to include Arizona and New Mexico in giving the distribution of that species in 1926. The genus *Neduba* is confined to the Pacific Coast, occurring nowhere east of the Cascades, Sierra Nevada and Sierra Madre. It is evident that Scudder's records noted above were both due either to mislabelling or incorrect determination.

Capnobotes fuliginosus (Thomas)

Type locality—Northern Arizona.

Capnobotes occidentalis (Thomas)

Anoplodusa arizonensis (Rehn)

Type locality—Florence. Originally referred to *Drymadusa*, Caudell proposed the genus *Anoplodusa* in 1907.

Plagiostira albonotata Scudder

Caudell described a "variety *brevipes*" from Williams, Arizona, in 1907. A fairly large series now before us shows that

the length of the limbs is variable individually and does not warrant nominal recognition.

Anabrus simplex Haldeman

7 miles north of VT Ranch on Kaibab Plateau (E. D. Ball).

Eremopedes bilineatus (Thomas)

1875. *Steiroxys bilineatus* Thomas, Rept. Expl. and Surv. West of 100th Merid., v, p. 950. [♀; San Carlos, Arizona.]

1899. *Cacopteris sinuata* Scudder, Proc. Amer. Acad. Arts and Sci., xxxv, p. 90. [♂; Fort Whipple, Arizona.]

1902. *Plagiostira albofasciata* Scudder and Cockerell, Proc. Davenport Acad. Nat. Sci., ix, p. 55, pl. 3, fig. 2. [♀; Mesilla Park, New Mexico.]

1905. *Plagiostira gracila* Rehn, Publ. Kans. Acad. Sci., p. 227. [♀; Bill Williams Fork, Arizona.]

This is one of the most plastic species of the Decticinae. Not only is the size variation enormous, but the extent and heaviness of the striking white markings also show wide extremes. Large series now before us show these features to have some geographic correlation, but except for the average increasingly greater size southward all other differences are apparently due to local environmental conditions. Comparison of the types of *sinuata* (later referred to *Idiostatus*) and *albofasciata* with our series and the descriptions of *gracila* and *bilineatus* convince us of the synonymy indicated above.

Eremopedes balli Caudell

Type locality—Williams.

Eremopedes ephippiatus (Scudder)

Eremopedes unicolor Scudder is a synonym established by Caudell in 1907. An immature from Nogales was recorded by that author as *Cacopteris punctata* Scudder in 1905 and as *Idiostatus fuscopunctatus* (Scudder) in 1907, and a series from the Baboquivari Mountains that year as *Eremopedes balli* Caudell by both Caudell and Snow.

Ateloplus minor Caudell

Type locality—Oracle.

Ateloplus coconino Hebard

Type locality—Bill Williams Fork.

Ateloplus schwarzi Caudell

Type locality—Tinajas Altas. Specimens from Tucson, the Baboquivari Mountains, Jerome, Florence and Hot Springs have been recorded as *Ateloplus notatus* Scudder, a species now known to be peculiar to the mountains of extreme southwestern California.

STENOPELMATINAE

Stenopelmatus fuscus Haldeman

Stenopelmatus oculatus Scudder was established as a synonym by Hebard in 1916.

Stenopelmatus intermedius Davis and Smith

Flagstaff (R. H. Beamer), Grand Canyon, Chiricahua Mountains (E. R. Tinkham), Santa Catalina Mountains south of Oracle (E. R. Tinkham).

RHAPIDOPHORINAE

Ceuthophilus paucispinosus Rehn

Type locality—Southern Arizona. The year this species was described (1905) Caudell recorded a male from the Huachuca Mountains as *C. californianus* Scudder. This led to Essig's including Arizona in the distribution of that exclusively Pacific coastal species in 1926.

Ceuthophilus arizonensis Scudder

Type locality—region about Prescott, Arizona. (Chiricahua Mountains (E. R. Tinkham).

Ceuthophilus pallidus Thomas

South fork of Pinery Canyon in Chiricahua Mountains (W. Stone), Douglas (W. W. Jones), Santa Rita Mountains (P. A. Readio), Oracle (E. R. Tinkham), eight miles west of Oracle (C. Reynard), Range Reserve near Tucson, Flagstaff (E. D. Ball), Prescott (O. C. Poling).

Ceuthophilus utahensis Thomas

Specimens from Jerome were recorded as *Ceuthophilus arizonensis* Scudder.

Ceuthophilus lamellipes Rehn

Type locality—Vicinity of Prescott.

(No less than nine new species of *Ceuthophilus* will shortly be described from Arizona in Hubbell's monograph.)

Pristoceuthophilus arizonae Hebard

Type locality—North slopes of Santa Catalina Mountains, south of Oracle.

Phrixocnemis neomexicanus (Scudder)

1894. *Ceuthophilus neomexicanus* Scudder, Proc. Amer. Acad. Arts and Sci., xxx, p. 100. [[Juv.] ♂; Fort Wingate, New Mexico.]

1905. *Udeopsylla serrata* Rehn, Trans. Kans. Acad. Sci., xix, p. 230. [♀, "Southern Arizona" (but probably mislabelled, actually coming from Oak Creek Canyon or the base of Humphreys Peak, San Francisco Mountains, at 9500 feet, type locality of the synonym *franciscanus*, whence came all other specimens of this species collected by F. H. Snow).]

1905. *Phrixocnemis neomexicanus* Hebard, Proc. Acad. Nat. Sci. Phila., lxxxi, p. 411. Synonym established of *Udeopsylla vierecki, Phrixocnemis franciscanus* and *socorrensis* (all Rehn).

Through the great kindness of the authorities of the University of Kansas the unique type of *Udeopsylla serrata* is now before us. Compared with the smallest males in our series from the San Francisco Mountains it is found to be almost exactly similar. The concealed genitalia in this specimen and adult male topotypes of *neomexicanus* are identical and of a type much nearer that found in *Pristoceuthophilus* Rehn than in *Ceuthophilus* Scudder. Failure to recognize the very great size variation shown by this species probably led to the description of this synonym.

Daihiniodes hastiferum (Rehn)

Type locality—Arizona. [San Carlos, (J. C. Bradley).]

Gryllidae

GRYLLINAE

Gryllus assimilis Fabricius

This tremendously plastic and widespread species has been recorded from Arizona as *alogus, armatus, neglectus, pennsyl-*

vanicus and *personatus*, names all placed as phases of *assimilis* by Rehn and Hebard in their 1915 revision.

Miogryllus lineatus (Scudder)

Miogryllus pictus (Scudder) was placed as a synonym by Hebard in 1915.

Gryllita arizonae Hebard

Type locality—Hendricks Canyon, Baboquivari Mountains.

NEMOBIINAE

Nemobius cubensis mormonius Scudder

Nemobius carolinus neomexicanus Scudder

Placed as a race by Hebard in his revision of 1913. Essig's 1926 " Arizona " record of *Nemobius mexicanus* Walker (synonymized under *Nemobius toltecus* Saussure by Hebard in 1913, a southern Mexico species) is probably based on material of the present race. Both Scudder and Woodworth had previously recorded material of this race as *toltecus* and as *mexicanus*.

OECANTHINAE

Oecanthus niveus (DeGeer)

Oecanthus exclamationis Davis

A part of the series recorded as *Oecanthus argentinus* from Carr Canyon in the Huachuca Mountains represents this species, which we also have from Reef. As this is an eastern species, widespread there but known to us from only these specimens west of Missouri and Arkansas, it would seem probable that it has been locally introduced in Arizona.

Oecanthus nigricornis quadripunctatus Beutenmuller

So much confusion has occurred in recording material of this species that we here give the localities for all the Arizona specimens before us. Kaibab National Forest, Prescott, Mount Union near Prescott, Senator, Yuma.

Oecanthus nigricornis argentinus Saussure

Specimens from Florence were recorded as *fasciatus* Fitch ? and from Tucson as *quadripunctatus*. Benson, Tucson, Tumamoc Hill in Tucson Mountains, Palo Alto Ranch in Altar Valley,

Hendricks Canyon in Baboquivari Mountains, Kvitak, Mount Union near Prescott, Florence, Mesa, Phoenix.

Oecanthus californicus californicus Saussure

Specimens from Bright Angel, Carr Canyon in the Huachuca Mountains and Palmerlee were recorded as *nigricornis* and others from Carr Canyon in the Huachuca Mountains as *argentinus*. Arizona material before us is from Ramsey and Carr Canyons in the Huachuca Mountains, Santa Rita Mountains, south slopes of Atascosa Peak in the Pajaritos Mountains, Austerlitz, Punta de Agua on Arivaca Creek, Tumamoc Hill in Tucson Mountains, Sycamore Canyon in Baboquivari Mountains, Bright Angel, Prescott, Phoenix, Hackberry, Kingman, Topock.

Oecanthus californicus pictipennis Hebard

MOGOPLISTINAE

Cycloptilum comprehendens fortior Hebard

Type locality—Ajo.

Hoplosphyrum boreale (Scudder)

Upper Madera Canyon in Santa Rita Mountains at 4900 feet (M. Hebard), Nogales (A. Koebele), south slope of Atascosa Peak in Pajaritos Mountains at 5100 feet (J. A. G. Rehn), Schaeffer Canyon in Baboquivari Mountains at 5100 to 5300 feet (M. Hebard).

MYRMECOPHILINAE

Myrmecophila manni Schimmer

The author in his revision of 1920 noted that the record of *Myrmecophila formicarum* Scudder from Madera Canyon in the Santa Rita Mountains was based on material of this species. At that time specimens from Williams were referred to *manni*, without noting that they had been recorded as *nebrascensis* by Caudell in 1903.

Myrmecophila nebrascensis Lugger

GRYLLOTALPINAE

In 1864 Uhler described *Gryllotalpa cultriger* from a male labelled El Paso, Texas. In 1869 Scudder recorded a female from California (belonging to the Smithsonian Institution) and another female without data (belonging to the Boston Society of Natural History). In 1926, Essig, as a result, gave " Texas, New Mexico, Arizona and California " for the distribution of the species. The only specimen before us is a female from Lone Mountain Cemetery, San Francisco, California, taken May 22, 1898, by Dr. W. H. Rush and belonging to the Academy of Natural Sciences of Philadelphia.

It is therefore probable that the distribution of this little known mole-cricket includes Arizona, though it has not yet been found in the State.

TRIDACTYLINAE

Tridactylus apicialis Say

Tridactylus minutus Scudder

The genus *Ellipes* was placed as a synonym of *Tridactylus* by Hebard in 1927.

ON CERTAIN MEXICAN AND CENTRAL AMERICAN SPECIES OF MELLIERA AND STAGMOMANTIS

(ORTHOPTERA: MANTIDAE)

BY JAMES A. G. REHN

(Plate X)

In the preparation of an extensive study of the Mantidae of Costa Rica, which recently appeared from the press,[1] it was necessary for me to examine virtually all the Mexican and Central American species of certain genera of the family, straighten out badly tangled synonymy and sex associations, and generally review our knowledge of the mantids found in Mexico and Central America. Thus I have been able to acquire a more logical and comprehensive knowledge of a large percentage of the species and their relationship, variations and exact distributions than had been possible previously. The basic reason for this is that there was available for study from Mexico and Central America as a whole many times the number of specimens previously examined by any student, most of this material taken in recent years and with exact localities and the full capture data which are so necessary in order to reach lasting conclusions.

The greater part of the information thus accumulated has appeared in the Costa Rican Mantidae study, while some will be utilized in other faunistic papers in preparation. Certain corrections of previous determinations, new forms and one case of newly established synonymy, which did not come within the scope of the Costa Rican study, it seems desirable to bring out independently, especially in the case of the genus *Stagmomantis*, so that all the conclusions reached which affect the status of specific names to be found in the literature of that genus will be available for the student.

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[1] Proc. Acad. Nat. Sci. Phila., LXXXVII, pp. 167-272, pls. 7-10, (1935).

Mellierinae

MELLIERA Saussure

Melliera mordax [2] new species (Pl. X, figs. 5 and 6.)

Closely related to *M. major* (Saussure, 1872) (=*M. atopogamia* Saussure, 1892) [3] from western and southern Mexico, but differing in the male sex in the lower and much less evident paired bosses at the cephalic extremity of the pronotal metazona, and in the more sharply sculptured dorsum and slightly more ampliate lateral margins of the prozonal section of the pronotum. The less elevated metazonal bosses are essentially as found in *M. chorotega* Rehn [4] from Costa Rica, but from that species *mordax* differs in its larger size, with proportionately heavier and longer cephalic femora, while its prozona has the lateral margins more ampliate. I have seen females of none of the three species of the genus.

Type.— ♂ ; Santa Emilia Pochuta, Guatemala.[5] Elevation, 1000 meters. February-March, 1931. (Joseph Bequaert). [Academy of Natural Sciences of Philadelphia, Type no. 5541].

Size medium; form as in other species of genus.

Head in cephalic aspect slightly narrower than in *major*, with the width across eyes as 10 to 6.5 in greatest depth of head, against 10.5 to 6.5 in *major;* occipital line, as seen in cephalic aspect, with lateral indentations deeply impressed, more so than in *major;* facial scutellum as in *major;* antennae when extended caudad reaching slightly caudad of median coxae.

Pronotum with greatest width across supra-coxal lobes contained slightly more than four times in the pronotal length, the least width immediately cephalad of the supra-coxal dilation contained five and a half times in pronotal length, greatest prozonal width contained exactly four and a half times in the pronotal length, and but slightly less than supra-coxal width:

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[2] I. e. given to biting.

[3] For discussion of this species, see Rehn, Proc. Acad. Nat. Sci. Phila., LXXXVII, p. 205 footnote, (1935).

[4] Proc. Acad. Nat. Sci. Phila., LXXXVII, p. 206, pl. 8, fig. 6 and 7, (1935).

[5] This locality is in the District of Chimaltenango, near the upper Rio Coyolate, about nine miles in an airline southeast of the Volcan de Atitlan, and about forty miles west by southwest from Guatemala City. Its position is about 91° 3′ W. and 14° 30′ 20″ N.

cephalic portion of margin roughly semi-ovate, in detail not evenly arcuate laterad but obtusely angulate; margins around lateral prozonal dilations subcrenulate arcuate, then narrowing rather sharply crenulato-concave in the constriction preceding the supra-coxal dilation, lateral margins of the latter moderately arcuate, subcrenulate; lateral margins of shaft shallowly concave, width of pronotum at caudal extremity equal to that at precoxal constriction and nearly one and a third times that of narrowest point of shaft, margins of latter but feebly crenulate and obsoletely so caudad: surface of prozona with sculpture similar to but more deeply emphasized than in *M. major*, median cephalic shoulder-like boss appreciably more marked; paired bosses cephalad on the metazona low, rounded, not mammillate as in *major*, intervening medio-longitudinal carina more marked than in *major*.

Tegmina and wings as in *major*.

Ultimate abdominal sternite (subgenital plate) narrowing distad, distal margin (between stylar bases) subtruncate, laterad obliquely emarginate to insertion of styles, latter tapering, blunted at apex, in length subequal to distance between insertion of same.

Cephalic coxae with seven spaced dentato-spinulations on the cephalic margin; cephalic femora with greatest depth at proximal third and contained four and a quarter times in greatest length of same, dorsal line, when seen in profile, faintly sigmoid; external spines four in number; internal spines fifteen in number, alternately larger and smaller, except that the second and third from distal end of series are both smaller than the first and fourth; discoidal spines four; groove at proximal third: cephalic tibiae with ten to eleven external spines, internal spines thirteen to fourteen in number: cephalic metatarsus one and one-fifth times as long as succeeding tarsal articles united, when limb is flexed reaching proximad exactly to the acute distal extremity of trochanter. Median and caudal limbs of the abbreviate type found in other species of the genus, median femora reaching but faintly caudad of caudal trochanters, caudal femora but briefly surpassing distal margin of third sternite.

General coloration tawny-olive to buckthorn brown; eyes dresden brown; antennae tawny; tegmina and wings hyaline, discoidal and most of the other longitudinal veins of the tegmina washed with green yellow (type) or honey yellow (paratopotype), these veins of discoidal field less distinctly tinted than the discoidal vein, cross nervures and to a degree the intercalated false longitudinal veins of the tegmina pencilled with cinnamon brown to dresden brown, fenestration of marginal field of tegmina pencilled in dresden brown. Cephalic femora with external spines, the shorter internal spines and the cephalic tibial spines tipped with blackish fuscous, longer internal femoral spines entirely blackish fuscous.

Measurements (in millimeters)

	Length of body	Length of pronotum	Greatest width of pronotum	Length of tegmen	Length of cephalic femur	Length of caudal femur
♂, Santa Emilia Pochuta, Guatemala, *type*	44.5	13.8	3.27	33.5	11	7.3
♂, Santa Emilia Pochuta, Guatemala, *paratype* .	45.8	13	3.10	33	10	7.4

In addition to the type I have before me a paratypic male having the same data as the type, and another male, also considered a paratype, from Sabanetas la Roja, Guatemala and belonging to the Museum of Comparative Zoology. The paratopotype is identical with the type except for its somewhat paler coloration (which is covered in the above color description). The Sabanetas la Roja individual has lost the apex of the abdomen and has been dried after liquid preservation, so it is somewhat shrivelled and its coloration has been altered and is unreliable.

Mantinae

STAGMOMANTIS Saussure

Stagmomantis hebardi[6] new species (Pl. X, figs. 1-4, 7-9.)

1923. *Stagmomantis tolteca* Hebard, Trans. Am. Ent. Soc., xlviii, p. 185. (Not *S. tolteca* (Saussure) and most authors.) [♂; Venvido (err. pro Venvideo) and Los Mochis, Sinaloa, Mexico.]

1923. *Stagmomantis limbata* Hebard, Trans. Am. Ent. Soc., xlviii, p. 186. (In part only *S. limbata* (Hahn).) [♀; Los Mochis, Sinaloa, Mexico.]

The above references are self-explanatory and the determinations were largely due to failure to properly associate sexes and to note the very distinctive genital features of the male.

This species is a member of the Carolina Group of the genus and more nearly related to *S. carolina* than any other form of the genus. It differs from *carolina*, however, in the male sex chiefly in the proportionately longer and more slender pronotum, the larger, more globosely protuberant eyes, proportionately smaller mandibles and whole buccal region, in the apex of the left ventral valve of the genitalia being cork-screw like and

[6] In appreciation of the numerous and important studies of my long-time friend and associate Mr. Morgan Hebard.

directed dorsad, instead of simply arcuate and aciculate as in *carolina*, and in the much shorter styles of the ultimate sternite (subgenital plate). The female differs from that sex of *carolina* chiefly in the less sharply trigonal cross-section of the pronotum, the more sharply converging lateral sections of the dorsal margin of the facial scutellum, the slightly more protuberant eyes when seen from the dorsum, the more uniform and greater width of the marginal field of the tegmina, the proportionately narrower anal field of the same, the proportionately smaller and less ample radiate field of the wings, and in the less squarely docked apex of the discoidal field of the same.

Type.— ♂ ; Venvideo, State of Sinaloa, Mexico. August 2 to 6, 1918. (J. A. Kusche). [Hebard Collection, Type no. 1283].

Size medium; form relatively slender.

Head, when seen in cephalic aspect, quite markedly transverse, greatest depth equal to but three-fifths of greatest width across eyes; occipital line, in cephalic aspect, straight between the shallowly marked cross impressions, thence laterad to eyes the margin faintly ascends; eyes prominent, moderately protuberant cephalad as well as laterad, globose, juxta-ocular protions of face appreciably concave; ocelli distinctly elevated, large, ovoid, placed in a somewhat flattened triangle; facial scutellum strongly transverse, its greatest median depth contained three times in greatest width of same, dorsal margin laterad oblique subsinuate, mesad briefly and shallowly obtuse-angulate emarginate, lateral margins diverging dorsad, surface of scutellum with dorsal margin raised above general level; mandibles and whole buccal region relatively small, greatest transverse width across base of mandibles but three-tenths that across eyes. Antennae when extended caudad reaching to base of wings.

Pronotum quite slender, greatest width across the supra-coxal expansions contained seven and a fourth times in greatest pronotal length, the expansion situated faintly cephalad of cephalic fourth and being one and two-fifth times as broad as the collar and one and three-fifth times as broad as the least width of metazonal shaft: cephalic margin of prozona (collar) obtusely rounded, lateral margins of same virtually subparallel, almost imperceptibly converging caudad, very sparsely and faintly tuberculato-denticulate, margins about supra-coxal expansions moderately arcuate, entire, lateral margins of shaft (metazona) cephalad as a whole subparallel, but evenly expanding to the supra-coxal expansions, caudad very gradually expanding to the broadly rounded caudal margin, which is nearly as broad as the prozona; in transverse section the pronotal shaft is markedly trigonal, with a pronounced medio-longitudinal carina on caudal two-thirds, cephalad passing into the usual sulcation.

Tegmina reaching to apex of abdomen, its greatest width contained four and three-tenth times in greatest length, apex narrowly rounded; marginal field marked solely in proximal third, its margin there moderately arcuate and the greatest width of field equal to one-fifth that of whole tegmen at same point, hyaline like all the remainder of tegmina; stigma structurally but weakly indicated. Wings reaching very faintly distad of tegminal apices when alar organs are in repose, apex narrowly rounded.

Ultimate abdominal tergite (supra-anal plate) moderately transverse, distal margin broadly arcuate: dorsal sinistral genital valve, when seen in caudal aspect, with its apex moderately arcuate sinistrad, rather thick, blunt and not at all hooked or bent; ventral sinistral genital valve, when seen from dorsum, with its spiniform extremity attenuate, strongly sigmoid in shape and with distal half of its cork-screw directed dorsad, immediate apex aciculate: ultimate sternite (subgenital plate) with distal (interstylar) margin very faintly and broadly obtuse-angulate, adjacent ventral surface briefly carinulate medio-longitudinally; styles very short, faintly tapering, blunt, separated by a marginal interspace equal to approximately three times the length of styles.

Cephalic limbs slender: coxae equal to approximately half length of pronotum, cephalic margin with five (as few as four in one paratype) moderate, well spaced lamellate dentations: cephalic femora slightly longer than half length of pronotum, shallow, greatest depth (at largest discoidal) contained virtually seven times in greatest femoral length; dorsal margin appreciably concave; external spines four, internal spines fourteen to fifteen, alternating in length, discoidal spines four, the first and second from base nearly equal in length, third strongly developed: cephalic tibiae with nine or ten external spines, increasing in length distad, internal spines thirteen, similarly increasing in length distad: cephalic metatarsi occupying seven-twelfths of total tarsal length. Median and caudal limbs slender, the caudal distinctly longer than median, caudal femora with their apices reaching to base of sixth abdominal sternite.

General coloration ranging from russet and dresden brown to prout's brown, in some male specimens all the limbs to variable degrees are courge green to apple green, while in the opposite extreme (brown phase) the limbs are more or less distinctly, although not regularly, transversely barred with mummy brown, occasionally (in the type) the barring on the median and caudal limbs being restricted to dark distal extremities, remainder of limbs greenish. Tegmina and wings hyaline with wing apices weakly and irregularly infuscate in brown phase specimens; stigma and a variable degree of scattered areolate maculations in the tegminal discoidal field (virtually absent in green phase extreme) prout's brown. Eyes prout's brown. Antennae with proximal article having all but its cephalic surface mummy brown. Cephalic coxae with dentations mummy brown; largest discoidal spine and larger series of internal spines of cephalic

femora, and apices of other femoral and tibial spines mummy brown; internal surface of cephalic femora with or without a cloud maculation of the same color immediately distad of groove.

Allotype.—♀; Los Mochis, Sinaloa, Mexico. Elevation, 25 meters. December, 1918. ((J. A. Kusche).

Head in cephalic aspect markedly trigonal, depth equal to 85 per cent. of greatest width across eyes, latter point at one-third depth of head; occipital line straight between cross sulci, thence laterad to eyes arcuately declivent, outline of eyes full, distinctly converging ventrad, seen from dorsum the eyes are relatively globose for the female sex, seen in cephalic aspect the greatest transverse width of eye is to greatest depth of same as is 3.5 to 5; facial scutellum basically as in male but greatest depth contained two and one-half times in greatest width, dorsal margin virtually straight oblique laterad while lateral margins are subparallel; buccal region with greatest width across base of mandibles but faintly less than half that across eyes. Antennae when extended caudad reaching nearly to caudal margin of pronotum.

Pronotum with greatest width across supra-coxal expansion contained nearly four times in greatest pronotal length, least width of shaft (metazona) exactly one-half that across supra-coxal expansion, metazona two and four-fifth times as long as prozona; lateral margins of prozona evenly and obliquely convergent cephalad to the rather narrowly rounded cephalic extremity, lateral margins with rather closely placed but rather blunt denticulations, supra-coxal dilations not emphasized, gently rounded, lateral margins thence caudad evenly but not strongly concave to the truncato-arcuate caudal margin of pronotum, where the width is approximately two-thirds that across supra-coxal dilation, margins of the shaft as a whole without the distinct denticulations seen on prozona, merely a few very low and blunt dentate tubercles indicated cephalad; transverse sulcus deeply impressed, median carina of shaft in caudal two-thirds distinct but low, prozonal median sulcus marked caudad.

Tegmina and wings reaching to apex of sixth tergite. Tegmina roughly elongate rectangulate, greatest width, which is at distal fourth, contained two and seven-tenth times in greatest length of same: costal margin weakly concave in median third, distad rather sharply arcuate to the broad rotundato-truncate apex: marginal field with median width very slightly greater than one-fourth total tegminal width, virtually subequal in breadth except briefly proximad and distad, where it narrows arcuately to base and apex respectively; and field long and narrow, its width but slightly greater than that of marginal field: venation of marginal field irregularly and angularly areolate on a background of four or more oblique spaced rami of the mediastine vein, oblique longitudinal rami of discoidal field and of various origins six in number; stigma marked, longitudinal, elongate elliptical. Wings broad, greatest width equal to five-sixths the length of

wing: costal margin nearly straight, distad rather sharply arcuate to the arcuato-truncate apex of the discoidal field; peripheral margin of the radiate field subcrenulato-arcuate: discoidal field proportionately somewhat broader than in *S. carolina*, its greatest width distad equal to two-sevenths of the total length of the wing.

Abdomen quite broad, distinctly depressed fusiform; ultimate tergite (supra-anal plate) transverse trigonal, its median length equal to two and three-fourth times the greatest proximal width of same, free margin nearly straight oblique laterad, with apex rather narrowly rounded. Cerci incomplete.

Cephalic coxae reaching caudad nearly to caudal margin of pronotum, moderately robust, dorso-external margin distinctly but rather delicately spaced serratulato-denticulate; caudal surface with numerous shagreenous asperities distributed along median section from proximal to distal extremities; cephalic margin biseriately spinose, the larger spines six to seven in number, the smaller ones intercalated one or two in groups between most of the larger spines: cephalic femora robust, greatest median depth contained five times in greatest length of same, dorsal margin nearly straight; external margin with four relatively long and stout spines, internal margin with fifteen biseriate spines, discoidal spines four, third from base over twice as long as second, thence proximad on ventral surface of femora is present a line of marked but rounded tuberculations; cephalic tibiae (without apical claw) approximately half the length of the femora, external margin with ten distally lengthening spines, internal margin with fifteen similarly lengthened spines; cephalic tarsi with metatarsus occupying nine-fourteenths of the total tarsal length. Median and caudal limbs moderately elongate, relatively slender; caudal femora but little shorter than pronotum, extended caudad they reach to approximately the apex of ultimate tergite (supra-anal plate); caudal tarsi with metatarsus in length equal to the succeeding articles combined.

General color light bice green to course green, on the pronotum (probably by desiccation) becoming olive-ocher to chamois, the median and caudal trochanters and proximal two-thirds of the same femora distinctly washed with buckthorn brown to mars brown. Antennae of the general tone proximad, distad progressively washed with mummy brown; eyes old gold clouded with mummy brown. Tegmina courge green, marginal field narrowly and irregularly dull wax yellow intermarginally, all veins more or less, but those of humeral trunk and anal field particularly, pencilled with meadow green to peacock green; stigma cream color: wings basically hyaline, almost entirely tessellate with quadrate patches of between greenish yellow and oil yellow, costal half of discoidal field solidly of this color, the more caudal half of same and all of radiate field with the usual tessellate pattern of females of the genus. Abdomen clay color to buckthorn brown. Cephalic coxae with spines of cephalic margin greenish white, of cephalic femora and tibiae tipped with prout's brown to mummy brown.

Measurements (in millimeters)

♂	Length of body	Length of pronotum	Greatest width of pronotum	Length of tegmen	Length of cephalic femur	Length of caudal femur
Type	50.5	17.5	2.68	31.5	10.2	13.2
Paratype	60	20	2.91	35.5	11.3	15.5
♀						
Allotype	44.5	16	4.03	20	13	14.2

In addition to the type and allotype I have before me four paratypic males, taken at the type locality July 28 to August 1 (2), August 2 to 6 (1) and August 8 to 10 (1), 1918, by J. A. Kusche. Of these two are in the extreme brown phase virtually without trace of green, one has the limbs almost entirely green, and the fourth, as well as the type, is in a condition approximately between the extremes. The above measurements show the range in size of the male material studied. A male in the instar preceding maturity from Los Mochis (December, 1917; J. A. Kusche) has also been examined. All these specimens belong to the Hebard Collection.

Stagmomantis fraterna Saussure and Zehntner (Pl. X, figs. 10 and 11.)

1894. *Stagmomantis fraterna* Saussure and Zehntner, Biol. Cent.-Amer., Orth., I, pp. 141, 144, pl. 9, figs. 7 and 8. [♂, ♀; Teapa, Tabasco, Mexico; R[io] Sarstoon, British Honduras; Guatemala; Tamahu, Vera Paz, Guatemala.]

1894. *Stagmomantis maya* Saussure and Zehntner, Biol. Cent.-Amer., Orth., I, pp. 141, 145, pl. 9, figs. 5 and 6. [♂ (referred with query), ♀; Temax, North Yucatan; British Honduras; Guatemala.]

Guatemala: Morales; February and March, 1931, June, 1930, June and July, 1929, September, 1930, November, 1928; (J. J. White); thirteen males, one female; [Hebard Cln.]. Chiquimula; November, 1930; (J. J. White); two males; [Hebard Cln.].

British Honduras: San Antonio; April and May, 1931; (J. J. White); three males; [Hebard Cln.]. Columbia; April, 1932; (J. J. White); two males; [Hebard Cln.]. Rio Grande; February, 1932; (J. J. White); five males; [Hebard Cln.].

Honduras: Prieta; April 8, 1924; (J. Bequaert); one male, one female; [A. N. S. P.]. San Pedro Sula; February 21 and March 23, 1922; (José Lienhart); two males; [A. N. S. P.].

On the basis of a series of twenty-eight males and two females I am definitely able to establish that *maya* is a synonym of *fraterna,* based on smaller individuals with proportionately broader pronota. The series of males from Morales alone proves these features are individual, exhibiting a considerable amount of size variation, as well as appreciable fluctuation in the exact width of the pronotum.

The species holds a distinctive position in the genus, forming a definite species group, as shown in the discussion of the genus in the Costa Rican Mantidae study already mentioned. The form of the ventral sinistral genital valve of the male is quite unlike that of any other species of *Stagmomantis,* while the pronotal form in both sexes is almost equally characteristic.

Stagmomantis montana sinaloae new subspecies (Pl. X, figs. 12 and 13.)

1923. *Stagmomantis limbata* Hebard, Trans. Amer. Entom. Soc., XLVIII, p. 186. (In part only *S. limbata* (Hahn).) [♂ [7]; Los Mochis, Sinaloa, Mexico.]

Elsewhere I have presented in considerable detail information on the variation found in *Stagmomantis montana* Saussure and Zehntner, and also the synonymy of that species. *Montana* [8] was founded on material from four Mexican localities and one in Guatemala, the latter of which, i. e. Volcan de Atitlan, at an elevation of 2500 to 3500 feet, I have selected as the restricted type locality.

A careful study of all the material of *montana* shows that the species breaks into two well-marked geographic races, to the more southern of which the name *montana* has been restricted by the designation of the type locality. The more northern subspecies, here described, can be distinguished in the male sex by the pronotum having the shaft proportionately less attenuate, the outline of the collar of the same being less evenly ovate than in

[7] Not the female recorded as *limbata* from the same locality, as this is the female of *S. hebardi* here described. The other material recorded in 1923 as *limbata* represents that species.

[8] Biol. Cent.-Amer., Orth., I, pp. 141, 142 and 146, pl. 9, fig. 4, (1894), [♂, ♀; Acapulco, Tepetlapa and Chilpancingo, Guerrero, Mexico; Cordova (Cordoba) [Vera Cruz], Mexico; Volcan de Atitlan, Guatemala].

S. m. montana, and with the lateral portions of its margins at least to a degree subparallel, by the cephalic limbs being proportionately more slender and delicate, and also by the marginal field of the tegmina being narrower and less strongly arcuate expanded proximad. The female sex of *S. m. sinaloae* is not known. For a discussion of this species as a whole the student is referred to my recent study of the Mantidae of Costa Rica.[9]

Type.— ♂ ; Los Mochis, Sinaloa, Mexico. May 16, 1930. (A. Dampf). [Hebard Collection, Type no. 1282].

The following features are entirely differential from those of typical *montana.*[10]

Size relatively small; form somewhat stockier.

Pronotum with greatest width across supra-coxal dilation contained four and three-fourth times in greatest length of pronotum, greatest width across prozona slightly greater than two-thirds the width across the dilation, least width of metazona (shaft) equal to half of dilation, length of metazona equal to two and six-seventh times the length of prozona; lateral margins of prozona (collar) approximately subparallel for half of the length of prozona caudad of the sinuato-arcuate cephalic margin, then evenly widening to the well-rounded supra-coxal expansion, thence caudad on the metazona the lateral margins are distinctly but not strongly concave, caudal margin strongly arcuate, lateral margins entire except on prozona, where they are obsoletely crenulate.

Tegmina not (type) or but briefly surpassing (paratypes) apex of abdomen; marginal field but moderately widened in proximal third, being distinctly narrower than in typical *montana,* distad from point of greatest width evenly narrowing, the margin thence not at all concave (as in *m. montana*).

Cephalic limbs more slender, greatest femoral depth contained six times in greatest length of same (less than six in *m. montana*).

General color courge green, by desiccation or discoloration sometimes (in paratypes) changed areally to dull amber yellow, pronotal shaft to a variable degree washed with russet. Eyes old gold to dresden brown. Antennae passing from the base color proximad to prout's brown. Tegmina greenish vitreous, veins pencilled with lumiere green to sometimes as dark as hellebore green; marginal field opaque, dull green-yellow (paratype), apple green (type) or bice green (paratype), internally, and in

[9] Proc. Acad. Nat. Sci., Phila., LXXXVII, p. 241 (1935).

[10] Compared with a male of the latter from Santa Emilia Pochuta, Guatemala.

contact with humeral trunk, lined with a variably emphasized band of cream white; humeral trunk usually (type and one paratype) broadly pencilled in proximal half with dull liver brown, of the color of the other veins in another paratype; stigma and immediate vicinity distinctly blotched with mummy brown. Wings greenish vitreous, veins greenish as in tegmina. Abdomen light cadmium to raw sienna, apically of the general color. Cephalic femora and tibiae with spines tipped with mummy brown.

Measurements (in millimeters)

	Length of body	Length of pronotum	Greatest width of pronotum	Length of tegmen	Greatest width of marginal field of tegmen	Length of cephalic femur
♂, *type*	51	15.5	3.27	34	1.68	11.1
♂, *paratype*	46	14.8	2.91	32.3	1.68	10.2
♂, *paratype*	51	15.5	3.36	36.5	1.76	11.7

In addition to the type I have before me two males, here considered paratypes, from the type locality, one taken December 2 to 10, 1917, by J. A. Kusche,[11] the other bearing the same capture data as the type, both being in the Hebard Collection. The dimensions of these specimens are given above.

The intergradation of *Stagmomantis montana* and *S. montana sinaloae* is demonstrated by evidence drawn from two males taken at localities in Mexico to the southward of Sinaloa, one being from Jojutla, Morelos,[12] the other taken at Monte Sumidero, Chiapas.[13] These specimens, while best considered atypical *m. montana* rather than exact intermediates, show clearly the passage from *S. m. sinaloae* to *S. m. montana.*

The separation of males of *S. montana sinaloae* from those of *S. limbata,* which also occurs in the same region, is not at all easy, except by actual and critical comparison. It is much less difficult to separate typical *montana* from *limbata,* than is true of *m. sinaloae,* which may represent the actual line of development of *m. montana* from *limbata,* or vice versa. The facial shield in *M. sinaloae* is slightly deeper proportionately than in

[11] This is one of those recorded by Hebard in 1923 as *limbata.*

[12] May, 1929; (J. J. White); [Hebard Cln.].

[13] May 30, 1926; (A. Dampf); [Hebard Cln.].

limbata, while the shaft of the pronotum is more regularly narrowed mesad, with its lateral margins more evenly concave than in *limbata,* which has the shaft more subequal in width and its lateral margins straighter. The whole pronotum in males of *montana sinaloae* appears shorter and stockier. The male sex of *S. m. sinaloae,* however, has the marginal field of the tegmina narrower than in *limbata,* differing thus much as it does from *S. m. montana.* The female sex of *m. montana* is quite readily separated from that sex of *limbata,* as I have pointed out elsewhere.

Explanation of Figures

Plate X

Fig. 1.—*Stagmomantis hebardi* new species. Male (type). Venvideo, Sinaloa, Mexico. Dorsal view. (× 1½.)

Fig. 2.—*Stagmomantis hebardi* new species. Male (type). Venvideo, Sinaloa, Mexico. Cephalic aspect of head. (Greatly enlarged.)

Fig. 3.—*Stagmomantis hebardi* new species. Female (allotype). Los Mochis, Sinaloa, Mexico. Dorsal view. (× 1½.)

Fig. 4.—*Stagmomantis hebardi* new species. Female (allotype). Los Mochis, Sinaloa, Mexico. Cephalic aspect of head. (Greatly enlarged.)

Fig. 5.—*Melliera mordax* new species. Male (type). Santa Emilia Pochuta, Guatemala. Dorsal view of cephalic portion of pronotum. (× 5.)

Fig. 6.—*Melliera mordax* new species. Male (type). Santa Emilia Pochuta, Guatemala. Lateral view of cephalic portion of pronotum. (× 5.)

Fig. 7.—*Stagmomantis hebardi* new species. Male (type). Venvideo, Sinaloa, Mexico. Ventral view of ultimate sternite. (Greatly enlarged.)

Fig. 8.—*Stagmomantis hebardi* new species. Male (type). Venvideo, Sinaloa, Mexico. Apex of dorsal sinistral genital valve (seen in caudal aspect). (Greatly enlarged.)

Fig. 9.—*Stagmomantis hebardi* new species. Male (type). Venvideo, Sinaloa, Mexico. Apex of ventral sinistral genital valve (seen in dorsal aspect). (Greatly enlarged.)

Fig. 10.—*Stagmomantis fraterna* Saussure and Zehntner. Male. Prieta, Honduras. Apex of dorsal sinistral genital valve (seen in caudal aspect). (Greatly enlarged.)

Fig. 11.—*Stagmomantis fraterna* Saussure and Zehntner. Male. Prieta, Honduras. Apex of ventral sinistral genital valve (seen in dorsal aspect). (Greatly enlarged.)

Fig. 12.—*Stagmomantis montana sinaloae* new subspecies. Male (type). Los Mochis, Sinaloa, Mexico. Dorsal outline of pronotum. (× 2.)

Fig. 13.—*Stagmomantis montana sinaloae* new subspecies. Male (type). Los Mochis, Sinaloa, Mexico. Outline of marginal field of tegmen. (× 1⅔.)

REHN — AMERICAN MANTIDAE

NEW NORTH AMERICAN SPECIES OF THE GENUS ALLOPERLA

(PLECOPTERA: CHLOROPERLIDAE)

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(Plates XI to XIV)

The genus *Alloperla,* in common with several other North American genera of stoneflies, contains a large number of species of rather similar habitus which are distinctly and easily separated into species on the basis of genital characters. In addition to these genital characters there are often constant differences in color markings which have not received the attention they deserve. In the following descriptions of new species of this genus I have tried to bring out by illustrations not only the structural characters essential for their recognition but also certain differences in coloration which I believe are constant within rather narrow limits.

Characters common to the genus as a whole, such as wing venation, lack of traces or remnants of nymphal gills because of absence in nymphs, many segmented cerci, etc., are not mentioned in connection with each description for the sake of brevity.

The males and females have been associated by virtue of males and females being taken at the same time and place and an agreement in distinctive color patterns.

The descriptions of these new species are based upon specimens collected in Tennessee and North Carolina by the writer; specimens from Cultus Lake, Chilliwack, British Columbia, collected by Dr. H. H. Ross, or upon material sent to me by Mr. R. E. Dimick of the Oregon State Agricultural College, Corvallis, Oregon.

All holotypes and allotypes are deposited in the collection of the Illinois State Natural History Survey. Paratypes are deposited in the collection of the Survey, the Oregon State Agricultural College, Corvallis, Oregon, and in the collection of the American Entomological Society, Philadelphia, Pennsylvania.

The drawings have been made for me by Dr. Carl O. Mohr, Associate Entomologist, Illinois State Natural History Survey.

Alloperla oregonensis new species

This species suggests *Alloperla novascotiana* N. & C. and *Alloperla pacifica* Banks in general broadness of supra-anal process but differs from either by combinations of characters described below and structures shown in illustrations.

Male.—Body, cerci, antennae and legs in general a light yellowish-brown; head, thorax and abdomen with some contrasting dark brown markings.

Head (Pl. XI, Fig. 10) with a large dark *V*-shaped area connecting median and lateral ocelli but not completely filling ocellar space and with a small dark spot on posterior margin of each side of middle of head; median ocellus located slightly anterior to a line between anterior margins of compound eyes, lateral ocelli located anterior to a line between posterior margins of compound eyes; distance between lateral ocelli slightly greater than distance between a lateral ocellus and adjacent compound eye.

Prothorax (Pl. XI, Fig. 10) much wider than long, hind angles more rounded than front angles, pronotum with outer margin bordered with dark brown and also dark brown markings on disk. Meso- and metathorax mostly pale yellowish-brown. Wings (Pl. XI, Fig. 3) slightly tinged with brownish, sometimes with longitudinal veins of cubitus and medius and some of the crossveins composing the cord stouter than other veins and hence more conspicuous.

Dorsum of abdomen (Pl. XII, Fig. 22) with a dark mesal longitudinal stripe extending for almost its entire length and with a shorter dark stripe on each basal dorso-lateral margin. Supra-anal process (Pl. XII, Figs. 18 and 22) broad and spatulate shaped. Ninth tergite (Pl. XIII, Fig. 32) with a distinct raised ridge which is cleft in the middle. Tenth tergite cleft for reception of supra-anal process and without inward pointing lobes or hooks at bases of cerci.

Length to apex of wings, 9 mm.; body length, 7 mm.

Female.—Except for being slightly larger, similar in most morphological features to the male. Eighth abdominal sternite with subgenital plate (Pl. XIV, Fig. 42) extending well over ninth and rounded behind.

Holotype.—Male; Salmon River, Mt. Hood National Forest near Welches, Oregon. June 18, 1933. (R. E. Dimick).

Allotype.—Female; same data as for holotype.

Paratypes.—6 ♂, and 3 ♀; same data as for holotype. 1 ♂; Bull Run River, Dodge Park, Oregon. June 22, 1933. (R. E. Dimick).

Alloperla diversa new species

This species will run closest in the key to the males of the genus *Alloperla* by Needham and Claassen (1925) [1] to *spatulata* N. & C. but shape of the supra-anal process is very different.

Male.—Body, cerci and legs in general a pale yellowish-white.

Head (Pl. XI, Fig. 5) with compound eyes and ocelli black, contrasting strongly with head; slightly wider than prothorax; median ocellus located in a line with anterior margins of compound eyes, lateral ocelli located well anterior of a line connecting posterior margins of compound eyes; distance between lateral ocelli much greater than distance between a lateral ocellus and adjacent compound eye. Antennae with basal segments concolorous with head and following segments gradually becoming darker towards tip.

Prothorax much wider than long, angles rounded, lateral margins of pronotum (Pl. XI, Fig. 5) with a narrow pale brown or black border, disk concolorous with head. Meso- and metathorax pale, except some sutures are distinctly outlined in dark brown or black. Wings (Pl. XI, Fig. 2) with membrane and veins uniformly pale.

Dorsum of abdomen (Pl. XII, Fig. 20) with a black or dark brown mesal longitudinal stripe extending backwards from basal segment over first seven tergites, sometimes a spot on eighth, and with a shorter dark stripe on each basal dorso-lateral margin extending backwards on first three segments. Supra-anal process (Pl. XII, Figs. 16 and 20) very short, inset on tenth tergite and with tip modified into a small rounded tab-like disk; eighth or ninth tergites (Pl. XIII, Fig. 31) without raised ridges; tenth tergite cleft for reception of supra-anal process and without inward pointing lobes or hooks at bases of cerci.

Length to apex of wings, 9 mm.; body length, 6 mm.

Female.—Except for being slightly larger, similar in most morphological features to the male. Eighth abdominal sternite (Pl. XIV, Fig. 40) with subgenital plate extending well over ninth sternite and rounded behind.

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[1] Thomas Say Found., II, pp. 106-108. (Monog. Plecoptera.)

Holotype.—Male; East Fork of Hood River, Parkdale, Oregon. May 7, 1934. (R. E. Dimick).

Allotype.—Female; same data as for holotype.

Paratypes.—6 ♂, 1 ♀; same data as for holotype.

Alloperla delicata new species

This species will run closest in the key to the males of the genus *Alloperla* by Needham and Claassen (1925) to *serrata* N. & C. but the front margin of the tip of the supra-anal process does not have any teeth. It is also close to *caudata* Frison (1934) but tip of supra-anal process is not globular shaped.

Male.—Body, cerci and legs in general a pale yellowish-white.

Head (Pl. XI, Fig. 6) with compound eyes and ocelli black, contrasting strongly with head; slightly wider than prothorax; median ocellus located in line with anterior margin of compound eyes, lateral ocelli located about on a line connecting posterior margins of compound eyes (drawing, Fig. 6, is slightly wrong in this respect); distance between lateral ocelli not much greater than distance between a lateral ocellus and adjacent compound eye. Antennae with basal segments concolorous with head and apical segments gradually becoming darker.

Prothorax (Pl. XI, Fig. 6) slightly wider than long, without dark markings and concolorous with head; meso- and metathorax concolorous with prothorax. Wings (Pl. XI, Fig. 1) with membrane and veins uniformly pale.

Dorsum of abdomen (Pl. XIII, Fig. 23) without any dark stripes or markings, concolorous with head and thorax. Supra-anal process (Pl. XIII, Figs. 23 and 24) very small, tip a mere recurved truncate projection not extending up over other tergites (Pl. XIII, Fig. 29); eighth and ninth segments (Pl. XIII, Fig. 29) without raised ridges; tenth tergite cleft for reception of supra-anal process and without inward pointing lobes or hooks at bases of cerci.

Length to apex of wings, 10 mm.; body length, 8 mm.

Holotype.—Male; Oak Creek, Corvallis, Oregon. May 8, 1934. (R. E. Dimick and E. E. Ball).

Paratypes.—2 ♂; Walker Creek, Bull Run, Oregon. June 21, 1933. (R. E. Dimick).

Alloperla fraterna new species

This new species will run closest in the key to the males of the genus *Alloperla* by Needham and Claassen (1925), like *diversa*, to *spatulata* N. & C. but the shape of the supra-anal process is quite different and the dorsal stripe on the abdomen is not broad. It

differs from *diversa,* described in this paper as new, in that lateral markings on pronotum are not similar and supra-anal process has a different shape.

Male.—Body, cerci and legs in general a pale yellowish-white.

Head with compound eyes and ocelli black, contrasting strongly with head; slightly wider than prothorax; median ocellus located about in line with anterior margins of compound eyes, lateral ocelli located well anterior of a line connecting posterior margins of compound eyes; distance between lateral ocelli much greater than distance between a lateral ocellus and adjacent compound eye. Antennae with basal segments concolorous with head and following segments gradually becoming darker towards tip.

Prothorax (Pl. XI, Fig. 4) wider than long, angles rounded; pronotum with a narrow dark or dusky longitudinal stripe on each lateral margin, disk concolorous with head. Meso- and metathorax concolorous with head. Wings with membrane and veins uniformly pale.

Dorsum (Pl. XII, Fig. 19) of abdomen with a narrow black or dark brown median longitudinal stripe extending backwards from base over first seven tergites, remainder of abdomen concolorous with meso- and metathorax. Supra-anal process (Pl. XII, Figs. 15 and 19) small, inset on tenth tergite and with tip slightly enlarged; eighth and ninth segments (Pl. XIV, Fig. 34) without raised ridges; tenth tergite cleft for reception of supra-anal process but without distinct inward pointing lobes or hooks at bases of cerci.

Length to apex of wings, 7 mm.; body length, 5 mm.

Female.—Except for being slightly larger, similar in most morphological characters to the male. Eighth abdominal sternite (Pl. XIV, Fig. 39) with subgenital plate extending somewhat over ninth sternite in middle area and rounded behind.

Holotype.—Male; Oak Creek, Corvallis, Oregon. May 22, 1934. (R. E. Dimick and E. E. Ball).

Allotype.—Female; same data as for holotype.

Paratypes.—4 ♂, 6 ♀; same data as for holotype. 1 ♀; Oak Creek, Corvallis, Oregon. May 8, 1934. (R. E. Dimick and E. E. Ball).

Alloperla elevata new species

This species will run in the key to the males of the genus *Alloperla* by Needham and Claassen (1925) closest to *serrata* N. & C. but the supra-anal process of the new species is shaped differently and it lacks teeth on its anterior margin. The supra-

anal process is somewhat like *fraterna* new species, as described in this paper, but it does differ and the abdomen lacks the dorsal dark median stripe.

Male.—Body, cerci and legs entirely a pale yellowish-white.

Head with compound eyes and ocelli black, contrasting strongly with head, thorax and abdomen; median ocellus located on a line with anterior margins of compound eyes, lateral ocelli about on a line with posterior margins of compound eyes; distance between lateral ocelli more than distance between each lateral ocellus and adjacent compound eye. Antennae with basal segments concolorous with head, apical segments darker.

Pronotum wider than long, all angles well rounded and without any dark markings; meso- and metathorax concolorous with prothorax. Wings with membrane and veins uniformly pale.

Abdomen entirely concolorous with head and thorax, without any dark markings. Supra-anal process (Pl. XII, Figs. 11 and 12) small, inset on tenth tergite and with tip somewhat dumb-bell shaped, in side view (Pl. XIII, Figs. 27 and 28) often with process much elevated but not recurved over eighth or ninth tergites; eighth and ninth tergites without any raised ridges; tenth tergite cleft for reception of supra-anal process and without distinct inward pointing lobes or hooks at bases of cerci.

Length to apex of wings, 11 mm.; body length, 7 mm.

Female.—Except for being slightly larger, similar in most morphological features to the male. Eighth abdominal sternite (Pl. XIV, Fig. 41) with a much enlarged subgenital plate extending back over ninth and tenth sternites.

Holotype.—Male; Floras Creek, Curry County, Oregon. May 22, 1933. (R. E. Dimick and Zella).

Allotype.—Female; Floras Creek, Curry County, Oregon. May 20, 1933. (R. E. Dimick).

Paratypes.—11 ♂; same data as holotype. 1 ♂, 10 ♀; same data as allotype. 4 ♂, 3 ♀; Fall Creek, Alsea, Oregon, May 1, 1934, (R. E. Dimick). 1 ♂; near Mill Creek, Alsea River, May 22, 1933, (R. E. Dimick). 1 ♂, 5 ♀; Siletz River, Logston, Oregon, May 24, 1934, (R. E. Dimick). 11 ♂, 10 ♀; Cultus Lake, Chilliwack, British Columbia, June 5, 1927, (H. H. Ross).

Alloperla neglecta new species

This new species runs, like several other species described in this paper and elsewhere (Frison, 1934),[3] in the key to males of

[2] Can. Ent., LXVI, pp. 25-30.

the genus *Alloperla* by Needham and Claassen (1935) to *serrata* N. & C. but differs in shape of supra-anal process.

Male.—Body, cerci and legs entirely a pale yellowish-white.

Head with compound eyes and ocelli black, strongly contrasting with rest of head and body; median ocellus in line with anterior margins of compound eyes, lateral ocelli much anterior to a line between posterior margins of compound eyes; distance between lateral ocelli little more than distance between a lateral ocellus and adjacent compound eye. Antennae with basal segments concolorous with head, following segments more fuscous.

Prothorax wider than long, all angles rounded and without any dark markings; meso- and metathorax concolorous with prothorax. Wings with membrane and veins uniformly pale.

Abdomen entirely concolorous with head and thorax and without any dark markings. Supra-anal process (Pl. XII, Figs. 13 and 14) small, inset on tenth tergite and with tip a mere oval-shaped tab, not recurved over other tergites (Pl. XIV, Fig. 35); eighth and ninth tergites without raised ridges; tenth tergite cleft for reception of supra-anal process and without inward pointing lobes or hooks at bases of cerci.

Length to apex of wings, 11 mm.; body length, 8 mm.

Holotype.—Male; New Found Gap, North Carolina, 3560 ft. elevation. May 28, 1934. (T. H. Frison).

Paratypes.—2 ♂ ; same data as holotype.

One of the male paratypes was reared from a nymph found just emerging from the water. The nymphal skin of this reared male agrees in general with the characterization of *Alloperla* nymphs given by Claassen (1931).[2] Like other *Alloperla* nymphs described to date, the color pattern is uniformly brownish and not distinctive. It is doubtful whether the nymphs of this genus can be satisfactorily separated to species, unless the mouth parts are shown to exhibit difference. If there are nymphs of *Alloperla* with a special or distinctive color pattern they are as yet unknown.

Alloperla exquisita new species

This species will run in the key to the males of the genus *Alloperla* by Needham and Claassen (1925) closest to *lateralis* Banks from the eastern United States but the supra-anal process is not so long or recurved at tip.

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[3] Thomas Say Found., III, p. 58. (Plecoptera Nymphs.)

Male.—Body in general a pale yellowish-white.

Head with compound eyes and ocelli black, contrasting strongly with general pale yellowish-white color; median ocellus in line with anterior margins of compound eyes, lateral ocelli slightly anterior to a line between posterior margins of compound eyes; distance between lateral ocelli slightly greater than distance between a lateral ocellus and adjacent compound eye. antennae with basal segments concolorous with head and apical segments darker.

Pronotum wider than long, angles rounded; pronotum with lateral margins narrowly margined with a dark border about as in *diversa* (Pl. XI, Fig. 5); meso- and metathorax pale yellowish-white except for some dark areas outlining certain sutures, and particularly conspicuous are the dark *U*-shaped marks on meso- and metanotum. Wings with membrane and veins uniformly pale.

Abdomen (Pl. XII, Fig. 21) pale yellowish-white except for a conspicuous median dorsal broad black longitudinal band extending backwards from base over first eight tergites. Supra-anal process (Pl. XII, Fig. 17) more elongate and with tip pointed, inset on tenth tergite; eighth tergite without any raised ridge; ninth tergite with distinct raised ridge on anterior margin (Pl. XIII, Fig. 30); tenth tergite cleft for reception of supra-anal process and without distinct inward pointing lobes or hooks at bases of cerci.

Length to apex of wings, 10 mm.; body length, 7 mm.

Holotype.—Male; Mt. Hood National Forest, near Welches, Oregon. June 18, 1933. (R. E. Dimick).

Paratypes.—2 ♂; same data as holotype. 1 ♂, Camp Creek, Mt. Hood National Forest, Oregon. August 2, 1923. (R. E. Dimick).

Alloperla dubia new species

This new species will run in the key to the males of the genus *Alloperla* by Needham and Claassen (1925) to *pallidula* Banks. These authors described *pallidula* Banks as having "a broad dark median dorsal stripe" on the abdomen but I am informed in a letter from Dr. Banks that the type from Beulah, New Mexico, does not have such a dark stripe. There is no evidence known to me which points to the conclusion that a species of *Alloperla* has two color phases; namely, one with and one without a dark dorsal abdominal stripe. Therefore, until evidence to the contrary is found, it seems necessary to consider that *pallidula* Banks is a species without such markings and that there

is at least another closely related species which has a black dorsal abdominal stripe.

This brings us to the question whether or not the species described here as new is the same as that called *pallidula* Banks by Needham and Claassen (1925). In view of statements in their description regarding presence of a "broad dark median dorsal stripe" it is very likely that some of the specimens recorded by these authors belong to this new species which I am naming *dubia*. It is not safe, however, to assume all their records for *pallidula* Banks pertain to *dubia* because of what has just been stated concerning the type specimen and a personal study of three specimens of the "Aug., Estes Park, Colo." recorded series which do not have a dark stripe and hence agree with the true *pallidula* Banks as here accepted.

Male.—Body, cerci and legs entirely a pale yellowish-white.

Head scarcely wider than prothorax; with compound eyes and ocelli black, strongly contrasting with rest of head and body; median ocellus in line with anterior margins of compound eyes, lateral ocelli in line with posterior margin of compound eyes; distance between lateral ocelli more than distance between a lateral ocellus and adjacent eye. Antennae with basal segments concolorous with head, following segments gradually more fuscous.

Prothorax not much wider than long, angles rounded; pronotum without dark markings except for a very faint and narrow fuscous border on lateral margins; meso- and metathorax entirely pale yellowish-white. Wings with membrane and veins uniformly pale.

Abdomen pale yellowish-white except for a narrow median longitudinal dorsal dark stripe extending backwards from base over first eight tergites. Supra-anal process (Pl. XI, Figs. 8 and 9) very small, inset on tenth tergite and with its tip a mere disk-like tab not recurved over eighth or ninth segments (Pl. XIV, Fig. 33); eighth and ninth tergites without raised ridges; tenth tergite cleft for reception of supra-anal process and with a very small lobe or hook (Pl. XI, Fig. 8) pointing inward at base of each cercus.

Length to apex of wings, 9 mm.; body length, 7 mm.

Female.—Except for being slightly larger, similar in most morphological features to the male. Eighth abdominal sternite (Pl. XIV, Fig. 37) with subgenital plate much produced backwards over ninth segment and with posterior margin broadly truncate.

Holotype.—Male; Camp Creek, Mt. Hood National Forest, Oregon. August 2, 1933. (R. E. Dimick).

Allotype.—Female; same data as for holotype.

Paratypes.—4 ♂, 5 ♀; same data as for holotype.

Some of the material listed by Needham and Claassen (1925) and by Neave (1929) as *pallidula* (not the true *pallidula* Banks because of presence of dark dorsal abdominal stripe) may represent an unnamed species closely related to *dubia.* This supposition is supported by the occurrence in the Survey collection of some specimens similar in most respects to *dubia,* but yet seeming to differ by being decidedly more brownish and with a subgenital plate in the female more like the illustration given by Needham and Claassen. The supra-anal processes of the males of these specimens are difficult to make out due to their poor condition as well as natural minuteness and flabbiness. Series of specimens from various localities are needed to clear up the problem as to the number of species involved in the *pallidula* complex or group.

Alloperla lodgei new species

This species was collected in a general locality yielding *mediana* Banks, *lateralis* Banks, *chloris* Frison and *imbecilla* (Say). It differs from all of these in certain color markings and in shape of supra-anal process. *Nanina* Banks, another species from this same general region, is easily distinguished because the tip of its supra-anal process is recurved.

Male.—Body, cerci and legs in general a pale yellowish-white.

Head (Pl. XI, Fig. 7) with compound eyes and ocelli black, strongly contrasting with rest of head; wider than prothorax; median ocellus located in line with anterior margins of compound eyes, lateral ocelli located well anterior of a line connecting posterior margins of compound eyes; distance between lateral ocelli much greater than distance between a lateral ocellus and adjacent compound eye. Antennae with first few basal segments concolorous with head and following segments gradually becoming much darker towards tip.

Prothorax wider than long, angles rounded; pronotum (Pl. XI, Fig. 7) with a dark brownish suffusion on disk, anterior and posterior margins darkest. Meso- and metathorax mostly pale yellowish-white but with certain sutures distinctly outlined in dark brown. Wings with membrane and veins uniformly pale.

Abdomen with a black or dark brown mesal dorsal longitudinal stripe extending backwards from base over first seven or eight tergites, a short

similarly colored stripe on each latero-dorsal margin extending backwards over first two segments, remainder of abdomen essentially pale yellowish-white. Supra-anal process (Pl. XIII, Figs. 25 and 26) small, inset on tenth tergite and sometimes raised (Pl. XIV, Fig. 36), tip small and tapering to a bifurcate point (Pl. XIII, Fig. 25); eighth and ninth tergites without raised ridges; tenth tergite cleft for reception of supra-anal process and without inward pointing lobes or hooks at bases of cerci.

Length to apex of wings, 9 mm.; body length, 7 mm.

Female.—Except for being slightly larger, similar in most morphological features to the male. Eighth abdominal sternite (Pl. XIV, Fig. 38) with subgenital plate produced backwards in a v-shaped manner over ninth sternite.

Holotype.—Male; Fighting Creek, branch of Little Pigeon River, Gatlinburg, Tennessee. May 27, 1934. (T. H. Frison).

Allotype.—Female; same data as for holotype.

Paratypes.—7 ♂, 8 ♀; same data as for holotype.

I take pleasure in naming this species for the late W. F. Lodge of Monticello, Illinois, an ardent and true conservationist, who was the writer's companion on the trip to the Smoky Mountain National Park when this new species was collected.

Alloperla nanina Banks

It is apparent, as in the case of *pallidula* Banks, that at least two species have been lumped under the name *nanina* Banks. Needham and Claassen (1925) describe *nanina* as a species "without a dark dorsal stripe" on abdomen. The original description of *nanina* does not mention a black dorsal stripe on the abdomen but Banks informs me in a letter that the type has such a stripe and this is also true of a cotypic female received from Banks by the Survey in an exchange of material.

Nanina Banks, then, must be considered as a species with a black dorsal stripe. That there is another unnamed species without a dark dorsal abdominal stripe now going under the name of *nanina* is evident from the description of Needham and Claassen (1925) and the collection of such a female specimen by the author at Caroline, New York, in August, 1928. Action in proposing a name for these specimens without a dark dorsal abdominal stripe, now confused with *nanina*, is delayed pending the study of further material.

Records of Alloperla from Oregon

Since only one species of *Alloperla,* namely *pacifica* Banks, has been previously reported from Oregon it seems desirable to record for that state the following records of previously described species. These data apply to adults only unless nymphs are specifically mentioned.

Alloperla borealis (Banks)

1 ♀, Alsea, Bull Run Creek, trib. of Fall Creek, May 30, 1934, (J. Schuh); 1 ♀, Bull Run, Walker Creek, June 21, 1933, (R. E. Dimick); 1 ♀, Bellnap Springs, June 23, 1930; 1 ♂ and 1 ♀, Corvallis, June 18, 1908, (J. C. Bridwell); 1 ♀, Alsea, May 23, 1931, (H. A. Scullen); 1 ♀, Waldport, July 15, 1925, (J. E. Davis); 1 ♀, Drift Creek, April 25, 1926; 1 ♀, Alsea, May 23, 1931, (H. A. Scullen); 1 ♀, Logston, Rock Creek, trib. of Siletz River, July 29, 1933, (R. E. Dimick); 1 ♀, Zig-Zag, Camp Creek, Mt. Hood National Forest, Aug. 2, 1933, (R. E. Dimick); 3 ♂ and 1 ♀, Corvallis, Oak Creek, March 31, 1934, (E. E. Ball); 1 ♂, Corvallis, Oak Creek, April 4, 1934, (E. E. Ball); 1 ♀, Corvallis, Oak Creek, April 13, 1934, (E. E. Ball); 4 ♀, Corvallis, Oak Creek, May 22, 1934, (E. E. Ball and R. E. Dimick).

Alloperla coloradensis (Banks)

1 ♂, Corvallis, March 30, 1934, (Don Prentiss); 1 ♀, Corvallis, Oak Creek, March 31, 1934, (E. E. Ball); 4 ♂ and 5 ♀, Corvallis, Oak Creek, April 4, 1934, (E. E. Ball); 2 ♂, Corvallis, Oak Creek, April 13, 1934, (E. E. Ball); 1 ♀, Corvallis, Oak Creek, May 16, 1934, (E. E. Ball); 1 ♂ and 1 ♀, Corvallis, Oak Creek, May 22, 1934, (R. E. Dimick and E. E. Ball).

Alloperla fidelis Banks

7 ♀, Alsea, May 23, 1931, (H. A. Scullen); 1 ♀, Alsea, May 28, 1934.

Alloperla pacifica (Banks)

1 ♀, Mt. Jefferson, Hunts Cove, elev. approximately 5000 ft., July 25, 1907, (J. C. Bridwell); 1 ♀, Euchre Creek, Curry County, May 20, 1933, (R. E. Dimick); several ♂, ♀, Floras Creek, Curry County, May 20, 1933, (Zellar and R. E. Dimick); 2 ♂, Elk River, Curry County, May 20, 1933, (R. E. Dimick); 4 ♀, Alsea, Fall Creek, trib. of Alsea River, May 1, 1934, (R. E. Dimick); 5 ♂, 7 ♀, Logston, Siletz River, May 24, 1934, (R. E. Dimick); several ♂, ♀, nymphs and adults, Siletz, Siletz River, May 24, 1934, (R. E. Dimick, Gray and Edwards).

Alloperla signata (Banks)

1 ♂, 20 miles S.W. of La Grand, May 11, 1930, elev. 4–5000 ft.

Explanation of Plates

Plate XI

Fig. 1.—Right front wing of *delicata* new species.

Fig. 2.—Right front wing of *diversa* new species.

Fig. 3.—Right front wing of *oregonensis* new species.

Fig. 4.—Pronotum of *fraterna* new species.

Fig. 5.—Head and pronotum of *diversa* new species.

Fig. 6.—Head and pronotum of *delicata* new species.

Fig. 7.—Head and pronotum of *lodgei* new species.

Fig. 8.—Dorsal view of last abdominal segments of male of *dubia* new species.

Fig. 9—Dorsal view of tip of supra-anal process of *dubia* new species.

Fig. 10.—Head and pronotum of *oregonensis* new species.

Plate XII

Fig. 11.—Dorsal view of tip of supra-anal process of *elevata* new species.

Fig. 12.—Dorsal view of last abdominal segments of male of *elevata* new species.

Fig. 13.—Dorsal view of last abdominal segments of male of *neglecta* new species.

Fig. 14.—Dorsal view of tip of supra-anal process of *neglecta* new species.

Fig. 15.—Dorsal view of tip of supra-anal process of *fraterna* new species.

Fig. 16.—Dorsal view of tip of supra-anal process of *diversa* new species.

Fig. 17.—Dorsal view of tip of supra-anal process of *exquisita* new species.

Fig. 18.—Dorsal view of tip of supra-anal process of *oregonensis* new species.

Fig. 19.—Dorsal view of abdomen of male of *fraterna* new species.

Fig. 20.—Dorsal view of abdomen of male of *diversa* new species.

Fig. 21.—Dorsal view of abdomen of male of *exquisita* new species.

Fig. 22.—Dorsal view of abdomen of male of *oregonensis* new species.

Plate XIII

Fig. 23.—Dorsal view of abdomen of male of *delicata* new species.

Fig. 24.—Dorsal view of tip of supra-anal process of *delicata* new species.

Fig. 25.—Dorsal view of tip of supra-anal process of *lodgei* new species.

Fig. 26.—Dorsal view of tip of abdomen of male of *lodgei* new species.

Fig. 27.—Lateral view of tip of abdomen of male of *elevata* new species, supra-anal process erect.

Fig. 28.—Lateral view of tip of abdomen of male of *elevata* new species, supra-anal process normal.

Fig. 29.—Lateral view of tip of abdomen of male of *delicata* new species.

Fig. 30.—Lateral view of tip of abdomen of male of *exquisita* new species.

Fig. 31.—Lateral view of tip of abdomen of male of *diversa* new species.

Fig. 32.—Lateral view of tip of abdomen of male of *oregonensis* new species.

PLATE XIV

Fig. 33.—Lateral view of tip of abdomen of male of *dubia* new species.

Fig. 34.—Lateral view of tip of abdomen of male of *fraterna* new species.

Fig. 35.—Lateral view of tip of abdomen of male of *neglecta* new species.

Fig. 36.—Lateral view of tip of abdomen of male of *lodgei* new species.

Fig. 37.—Subgenital plate of female of *dubia* new species.

Fig. 38.—Subgenital plate of female of *lodgei* new species.

Fig. 39.—Subgenital plate of female of *fraterna* new species.

Fig. 40.—Subgenital plate of female of *diversa* new species.

Fig. 41.—Subgenital plate of female of *elevata* new species.

Fig. 42.—Subgenital plate of female of *oregonensis* new species.

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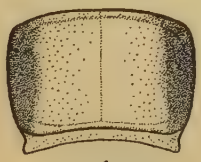

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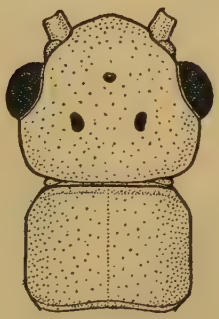

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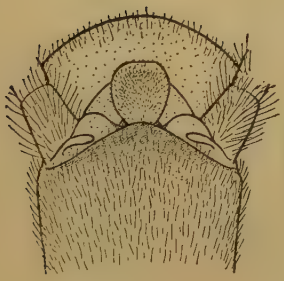

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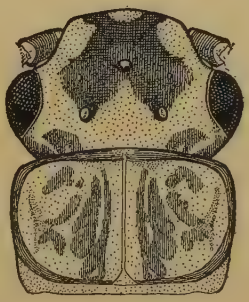

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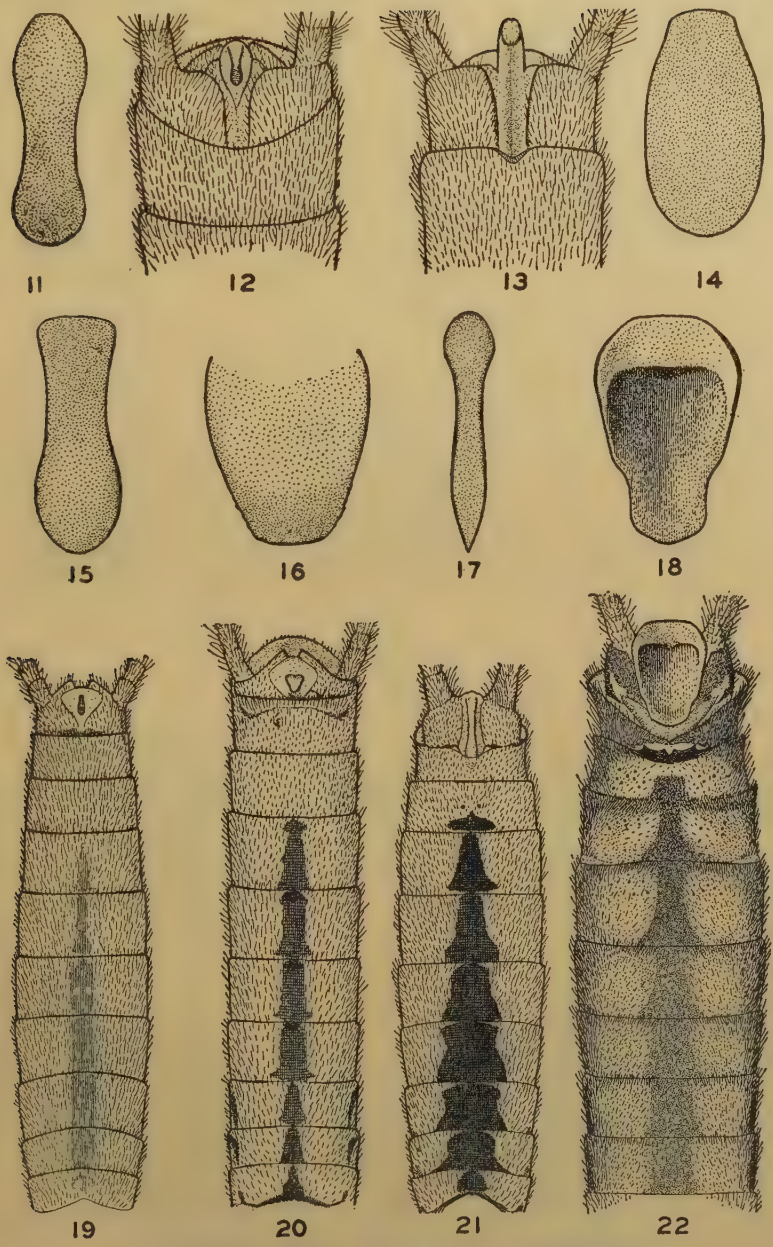
FRISON—NEW AMERICAN ALLOPERLA



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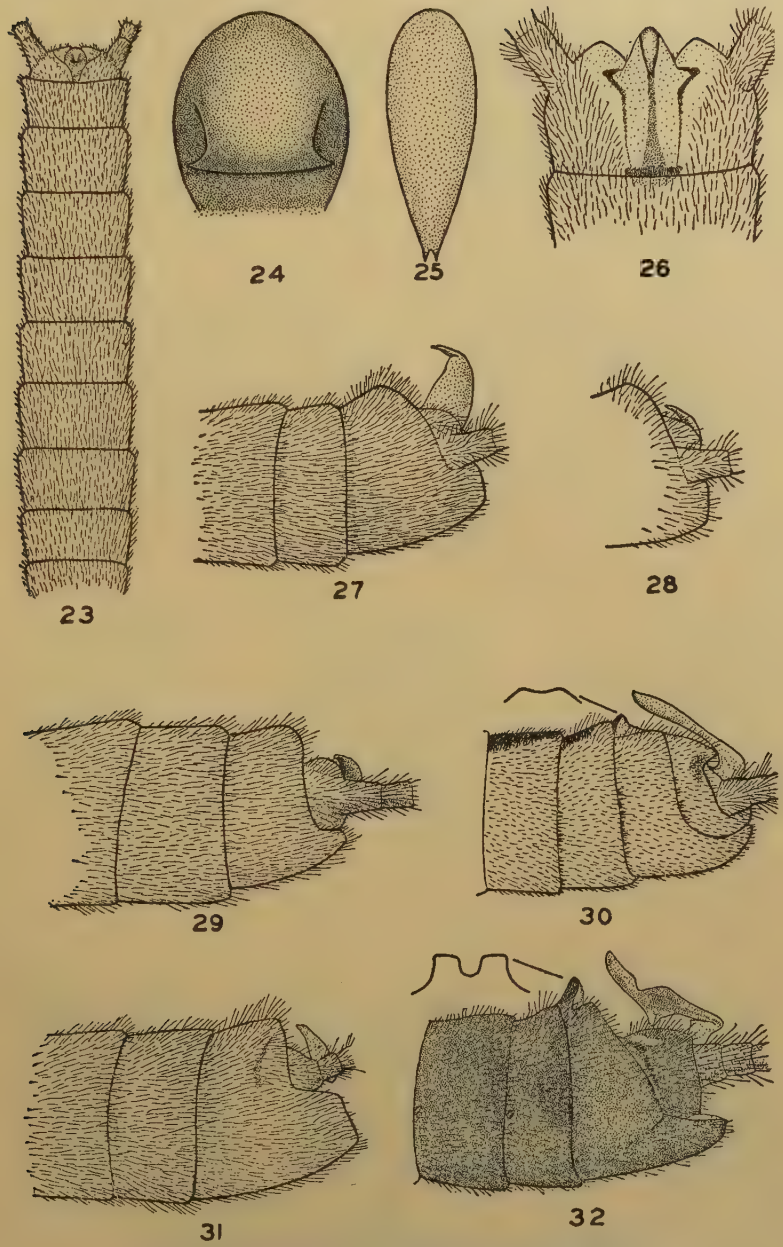

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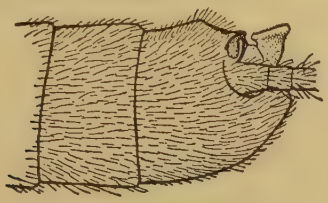

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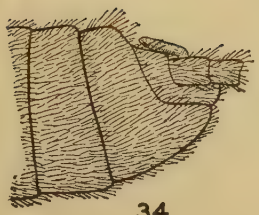

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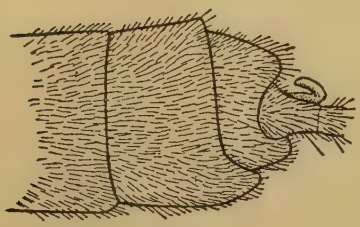

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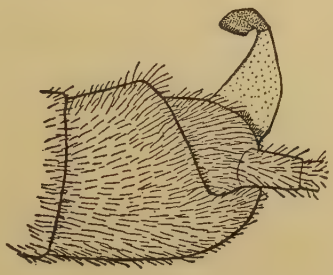

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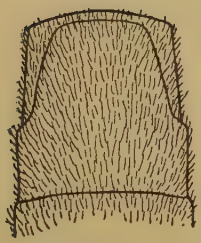

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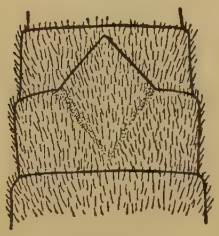

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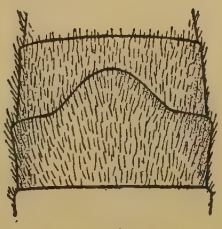

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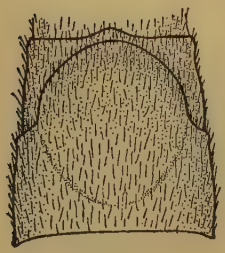

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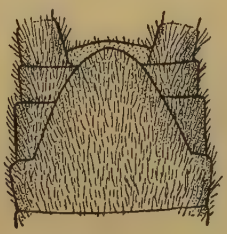

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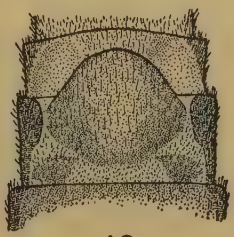

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FRISON—NEW AMERICAN ALLOPERLA

DESCRIPTIONS OF GENERA AND SPECIES OF THE DIPTEROUS FAMILY EPHYDRIDAE

BY EZRA T. CRESSON, JR.

Subfamily Ephydrinae

In 1916, after eight years' study of considerable amount of material of this family, I began to publish what was intended to be a series of papers treating of the American species. Each paper was to be complete in itself, in form of a revision of one or more genera. After publishing three such revisions (1916 to 1922), I realized that a better understanding of the genera and species of the World was necessary before intelligent work could be done on our own fauna. Since then I have studied much material and have described a number of genera and species from many parts of the world. The results of these studies have been published in a number of papers, and include descriptions of many new North American species. I now feel that my knowledge of this family, and the use of the great mass of material acquired for study will allow me to produce, what I hope will be a fairly complete monograph of the North American species. As this work may be several years in preparation, I am publishing the present series of descriptions and taxonomic notes to take care of the new genera and species, and nomenclatorial changes that develop in the course of this study. The present series, however, will not be confined to the species of the American fauna.

DAGUS[1] new genus

The laterally curved frontorbitals, the prominent setulose medifacies, the long rather straight claws and rudimentary pulvelli, place this genus in the tribe Ephydrini. The interfoveal hump, so characteristic of the other genera of this tribe, is wanting here, the facial profile showing a deep indentation above the

[1] Δαγυς, a puppet.

series of facial bristles. All the latter are curved upwards; three frontorbitals are present; arista very long and short-haired to tip. The dorsocentrals are arranged 1 : 3; the prescutellar acrostichal pair is present but not much stronger than the strong acrostichal setulae; humeral bristle weak, no posthumeral, one presutural, two weak intraalars, one postalar, two notopleurals, one mesopleural, one sternopleural. Four scutellars, the lateral one weak. Abdomen rotund. Legs slender, with bristles as in *Ephydra*.

GENOTYPE: *Ephydra rostrata* Cresson, 1918.

Dagus rostrata (Cresson)

1896. *Ephydra pygmaea* Williston, (not of Haliday, 1833) Trans. Ent. Soc. London, 1896, p. 402, pl. 13, fig. 147.

1918. *Ephydra rostrata* Cresson, Trans. Am. Ent. Soc., XLIV, p. 66, pl. 3, fig. 27.

Originally described from St. Vincent Island, British West Indies, this species has since been recorded from Costa Rica (Cresson, 1918). Another specimen, a female is before me, without locality label, but bearing one label " 500 feet ", was given to me by Dr. Williston among some Brazilian material.

Setacera knabi new species

Similar to *S. atrovirens* (Loew) but the foveae are distinctly shining, with but a slight trace of whitish dusting.

Halteres, squamae, base of wings, knees especially of the fore legs, yellow to ochraceous. Wings slightly brownish with dark veins.

Frons, upper part of face, mesonotum especially postsuturally and scutellum, shining, metallic blue to green; abdominal dorsum more obscured, with bronze tone. Medifacies niveous becoming golden at the upper margin. Fore part of mesonotum more or less dusted with dark ochraceous becoming densely so at margins; pleura densely dark ochraceous becoming grayish below. Femora light gray over metallic blue.

Structurally similar to *atrovirens*, but arista distinctly haired above and fifth tergite of male twice as long as fourth.

Length, 3.6 mm.

Type.—♂ ; Miami, Florida. February 23, 1917. (F. Knab). [U.S.N.M., no. 51098].

Paratypes.—3 ♀ ; topotypical.

Setacera needhami Johannsen

1935. *Setacera needhami* Johannsen, Mem. Cornell Univ., 177, p. 53, pl. 12, fig. 130. (Larva only as of *Setacera needhami* Cresson, not published.) [2]

The following description is based on one male and three females from Laguna Canyon, Orange County, California, collected by Dr. J. G. Needham, on shore of pond, September 1922. These specimens are in the collection of The Academy of Natural Sciences of Philadelphia.

Structurally similar to *S. atrovirens* (Loew), and *S. knabi* here described, but more shining and the entire insect has a bluish tone; the denuded shining dorsal areas brilliant metallic blue with purple and bronze tones. Mid and hind tibiae of male with distinct tufts of long hair at apices.

Knees of fore legs narrowly yellowish. Frons smooth; facial foveae at most slightly pollinose; interfoveal area flat and narrow, scarcely broader than distance between antennae. Face and cheeks niveous or with yellow tone; facial setulae unusually strong, especially in the male, scarcely weaker than some of the facials. Third antennal segment elongate; arista with rather long hairs.

Mesononotal setulae weak; those in the acrostichal series in two distinct rows. Fifth abdominal tergite of male slightly longer than fourth and acute apically; genital spine of female diverging from approximate bases. Mid femora of male with flexor cluster of characteristic bristles on basal third; mid and hind tibiae of male with long hairs on posterior apical third.

Length, 3.5 to 4 mm.

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[2] The description of the larva of this species was, unfortunately, published while the present paper was in preparation. Adults were submitted to the writer by Prof. Johannsen among other ephyrids, for determination, and the name *Setacera needhami* was given to him as that of a new species. No intimation was given the writer that the name was to be used in a forthcoming work on the larvae of aquatic Diptera. Had the writer been aware of this proposed use, he could have had the present description of the adults published prior to that of the larva, thus more satisfactorily establishing the status of the species. As is the case with *Ephydra gracilis* Parkard, the name of the present species will have to be based on the description of the larvae. It is hoped that the larvae and adults, here described, are conspecific.

Setacera aldrichi new species

Similar to *S. pacifica* Cresson, 1925, but the fifth tergite of the male is broadly truncate apically.

Black; halteres yellow, bases of tibiae yellowish. Frons metallic greenish blue, weakly rugulose and finely roughened medianly; the black frontalia scarcely differentiated. Face strongly retreating below, prominent and convex above; interantennal area opaque brown; interfoveal area flat or slightly depressed, concolorous with, and the surface sculpturing same as on, mesofrons; facial series of bristles not contiguous for a distance equal to width of interfoveal area, and extend well below line of buccal orbits; foveae and contiguous orbital area shining metallic bronze; lower medifacies silvery-white below, becoming brown above. Oral cilia sparce. Cheeks in width about .3 diameter of eye.

Mesonotum opaque brown anteriorly, more shining bronze posteriorly, with two distinct presuturals; of female more grayish and anterior portion more shining. Scutellum shining metallic colored. Pleura opaque yellowish brown, becoming grayish below. Abdomen subopaque bronze, opaque beneath; fifth tergite of male almost quadrate, with lateral apical angles subtuberculose; genital segment grooved medianly. Femora opaque grayish brown, tibiae more metallic colored. Wings brownish.

Length, 4.5 mm.

Type.—♂; Potlatch, Idaho. June 20, 1907. (J. M. Aldrich). [A.N.S.P., no. 6515].

Paratype.—1 ♀; topotypical.

Setacera durani new species

A slender species with the general habitus of *S. pacifica* (Cresson) but more shining on the mesonotum and the setulae of the latter very inconspicuous. Mid tibiae of the males with some long hairs on posterior surface at apex.

Halteres, squamae, base of wings, knees of all legs and the spinose genital tubercle of female, yellow to ochraceous.

Frons, foveae and interfoveal area shining metallic green to blue, weakly micro-granulose. Lower part of face, and cheeks, niveous. Mesonotum smooth, shining blue to green and bronze with anterior portion, humeri, notopleura more or less opaque ochraceous to grayish; pleura opaque pale olivaceous becoming grayish below. Scutellum concolorous with mesonotum. Abdomen subopaque metallic blue and bronze, overcast with light gray. Femora concolorous with pleura.

Structurally similar to *pacifica*. Eyes more prominent and more produced caudad, resulting in a strongly concaved occiput. Interfoveal area

large, flat, as broad as anterior margin of mesofrons. Facial bristles weak; medifacial setulae very sparse and inconspicuous. Third antennal segment twice as long as broad; arista with long hairs. Mesonotal setulae and the acrostichals hairlike, the latter in two distinct series; humeral and posthumeral bristles short. Fifth abdominal tergite of male one and one-half times as long as fourth, much narrowed apically. The paired genital spines of female on distinct, separated tubercles. Mid tibiae with distinct tuft of long hairs at apex on posterior surface.

Length, 4.2 to 4.5 mm.

Type.—♂ ; Los Angeles, California. August 15, 1916. (V. Duran). [A.N.S.P., no. 6516].

Paratypes.—1 ♀ ; topotypical, Aug. 15, 1915.

DIMECOENIA Cresson

This genus seems to take the place of *Ephydra* in South America. All the species heretofore described under that genus, known to me, prove to belong here. It is distinguished from *Ephydra* by the absence of the posthumeral and prescutellar acrostichal bristles; the presence of only two frontorbitals and the presence of a spinose subbasal internal lobe on the genital prongs of the males. The South American species known to me are smaller than those from North America, and the cruciate interfrontals are much weaker or are not at all distinguishable from the surrounding setulae.

Of this genus there are six species known to me from South America and the Galapagos Islands. These may be separated by the following key. A seventh, *D. zurcheri* Hendel (1933) I have not recognized in the material at hand.

1. Mid and hind femora mostly black; their tibiae reddish. 2
   Mid and hind femora mostly pale. 4

2. Bristles and setae long and dense. .....*prionoptera* Thomson
   Bristles and setae not appreciably long and dense. 3

3. Cheeks at most one-fourth height of head. .....*caesia* v. d. Wulp
   Cheeks at most one-third height of head. .....*cotaensis* new species

4. Abdomen shining metallic colored, scarcely obscured by pollen; dark parts of femora metallic colored. .....*gilvipes* Coquillett
   Abdomen subopaque, the metallic ground color much subdued by the pollinose vestiture. 5

5. Mesonotum with faint interdorsocentral pollinose stripes; face pale yellow; fore femora mostly dark. .....*chilensis* Macquart
   Mesonotum without pollinose stripes; face dark yellow; fore femora not dark. .....*abrupta* new species

Dimecoenia prionoptera (Thomson)

1868. *Ephydra prionoptera* Thomson, Eug. Resa., Zool., I, p. 590. [Patagonia.]
? 1930. *Ephydra densepilosa* Hendel, Knowia, IX, p. 152. [N. Argentina.]
1931. *Ephydra prionoptera* Cresson, Dipt. Pat. & S. Chile, VI, p. 85. [Note and translation of original description.]
1931. *Dimecoenia densa* Cresson, Dipt. Pat. & S. Chile, VI, p. 105. [Chile.]
? 1933. [*Dimecoenia*] *densepilosa* Hendel, Rev. Ent., III, p. 223. [Generic change.]
1933. *Dimecoenia prionoptera Edwards*, Dipt. Pat. & S. Chile, VI, p. 119. [Syn. *D. densa* Cresson.]

The synonymy of *densa* was established by Edwards (1933) after he examined the type of *prionoptera*. The synonymy of *densepilosa* is questioned on the grounds that Hendel's description calls for pale legs and the cheek " fast 1/4 eines Auges hoch ". These however may be merely variational characters; the long dense pile and the strongly developed bristles being the specific characteristic. A large species with the face and dorsal surfaces brown to yellow ochreous, the shining parts scarcely metallic colored. Femora black; tibiae and tarsi brown. Here we have the genital prongs of the male stout, with the spinose subbasal internal lobe elongate, almost attaining apex of the prongs.

In addition to my 1931 record of this species as *densa* from Chile, I have it represented by a series of eight males and seven females collected near a pool on the beach below Barranca Montes Casa, 7 miles south of Coyley, South Patagonia, Feb. 4, 1900 by B. Brown, [Am. Mus. Nat. Hist.]. The individuals of this series average slightly smaller than those from Chile.

Dimecoenia chilensis (Macquart)

1850. *Ephydra chilensis* Macquart, Dip. Exot., Suppl., IV, p. 303, pl. 28, fig. 15. [Chile.]
1852. *Ephydra chilensis* Blanchard, Gay's Hist. Chile, Zool., VII, p. 464. [Orig. descr. quoted.]
1931. *Ephydra chilensis* Cresson, Dip. Pat. & S. Chile, VI, p. 85. [Note.]

In my paper on the Ephydridae of Patagonia and South Chile (1931) I cited this species as without doubt belonging to the Ephydrinae, but at that time was not acquainted with any member of that subfamily from Chile, with yellow legs. Recently I received series of two apparently different species of the present genus from Chile and Argentina having the legs entirely pale. Of these two forms, which differ rather markedly in the form of the male genital segment, the one from Chile is in fair agreement with Macquart's brief description, especially as regards the face being gray, tinged with yellow; the frons blue; thorax and abdomen dusted with gray; legs with fore femora black and the others brown medianly. I am therefore considering this form *chilensis* and redescribe it in more or less detail, from the series at hand.

Tips of palpi, halteres, squamae, wing-veins and legs yellow to buff; femora more or less medianly especially above, fore tibiae and tarsi sometimes, and apices of all tarsi, darker, brown and somewhat overcast with whitish pollen. Wings hyaline, sometimes with buff tone.

Frons medianly shining metallic green to blue as is also the interfoveal area; frontalia and parafrons opaque brown to grayish. Face grayish becoming ochraceous above. Cheeks and occiput whitish. Mesonotum ochraceous becoming shining metallic bronze, sometimes bluish, medianly and postsuturally; in certain aspects showing faint inter- and extra-dorsocentral pollinose stripes, and faint acrostichal and inter-alar bronze stripes. Humeri scarcely lighter. Pleura pale ochre becoming whitish below including metanotum. Scutellum shining, concolorous with mesonotum, grayish marginally. Abdomen somewhat shining bronze with apical half of tergites grayish or bluish.

Head in profile, longer than high (as 31:28). Frons horizontal; cheeks .25 height of head. Facial projection almost .33 length of head. Eyes oblique. Frons broader than long, about .66 width of head (as 26:43); mesofrons quadrate with shallow anteocellar sulcus, extending about .66 of distance to lunular margin; no distinct interfrontal bristles. Face slightly narrower than frons; medifacies, in profile slightly convex, rather densely setulose; facials rather strong, but absent or very weak in median part of series. Oral cilia sparce; postbucca slightly turgid, weakly setulose. Antennae situated far above center-line of eyes; arista pubescent above.

Mesonotal setulae weak, leaving bare interdorsocentral antesutural stripes. Scutellum convex, about as broad as long, roundly pointed apically. Abdomen ovate, the setulae appressed and sparce, bristle-like towards apical margins of tergites, especially of fourth and fifth; fifth of

male longer than fourth, triangular; genital segment with prongs long and very narrow meso-laterally and very close together, broader dorso-ventrally except at the pointed apices; the paraprocts invisible.

Fore femora with some post-extensor bristles; mid femora of male with weak flexor ciliation and few post-distal bristles; flexor spurs of hind tibiae very short; setae of mid coxae not flexose.

Length, 3.5 to 4 mm.

The above description is based of two males and two females from Anapa Valley, Prov. Tacana, Chile, June, 1912, (C. E. Porter), [U.S.N.M.].

Dimecoenia caesia (van der Wulp)

1883. *Ephydra caesia* van der Wulp, Tijd. v. Ent., XXVI, p. 58. [Argentina.]

1930. *Ephydra pravoneura* Hendel, Knowia, IX, p. 150. [Argentina.] (New syn.)

1931. *Dimecoenia caesia* Cresson, Dipt. Pat. & S. Chile, VI, p. 104. [Gen. comb.]

1933. [*Dimecoenia*] *pravoneura* Hendel, Rev. Ent., III, p. 223. [Gen. comb.]

I feel reasonably sure of the synonymy of *pravoneura* as I find no differentiating characters of specific importance.

It is not improbable that this is merely a darker form of *chilensis*, in which we have all femora except their extreme apices black and their tibiae reddish. The general pollinose vestiture of the body is darker and the metallic colors are less pronounced. The characteristic pollinose interdorsocentral stripes of *chilensis* are present here.

The original description was based on a female, but that author also had a male which he states is more greenish, with entirely pale legs. This latter may be what I am considering *chilensis*.

To my records of this species from Argentina and Uruguay (1931), I can add: Angol, Chile, Nov. 28 and Jan. 1, (D. S. Bulloch), [U.S.N.M., 6]. San Rosendo, Concepcion, Chile, Dec., (R. & E. Shannon), [U.S.N.M., 1]. Mendoza, Argentina, Dec. 12, [Deut. Ent. Inst., 2].

Dimecoenia abrupta new species

Similar to *chilensis* in its pale legs, which latter do not show much if any darkening on the femora, fore tibiae or tasi. The general body color is more uniformly golden-ochraceous; the face showing very little white

except at extreme lower margin; mesonotum more uniformally pollinose, the shining surface having a purple tone, with some vittation. Abdomen uniformly glaucous with faint bronzing; the apical portion of the tergites not so contrastingly lighter; fifth tergite of male about twice as long as fourth; genital segment large with prongs short and turned abruptly dorsad but not very different in form otherwise from those of *chilensis*.

Length, 3.5 to 4.2 mm.

Type.—♂; Mendoza, Argentina. December 17, 1904. [Lichtwardt Collection; Deut. Ent. Inst.].

Paratypes.—1 ♂, 1 ♀; topotypical.

Dimecoenia coltaensis new species

Similar to *chilensis* but femora except apices black and tibiae reddish. Head higher, only slightly longer than high (as 36 : 32). Cheeks broader, about .33 height of head. As the series before me have evidently been collected in liquid, the pollinose vestiture is discolored; that of the upper surfaces and upper part of the face is brown ochre with the humeri contrastingly gray; the interdorsocentral stripes are merely suggested; the metallic color seems to be bluish.

A male paratype has the interfrontal bristles distinct, on one side quite strong; the other specimens show these bristles very weak. The bristles and hairs of the legs are noticeably longer than in *chilensis*. The fifth tergite of the male is not longer than the fourth; the genital segment similar to that of *chilensis*.

Type.—♂; Colta, Ecuador, 3280 feet alt. (F. Campos). [U.S.N.M., no. 51100].

Paratypes.—2 ♂, 3 ♀; topotypical.

Dimecoenia gilvipes (Coquillett)

1901. *Ephydra gilvipes* Coquillett, Proc. Wash. Acad. Sci., III, p. 377.

This species was described from a male and five females from Albemarle Island, Galagagos. It has the general habitus of *chilensis* but is more metallic blue to green, especially the abdomen; not so much obscured by the pollinose vestiture. The color of the latter is gray to whitish, scarcely anywhere yellowish. The mesonotum is more bluish, showing an acrostichal stripe, and broadly bronze along lateral margins but leaving the humeri whitish. Legs for the most part pale; the small amount of

darkening is on the median extensor surfaces of the femora, which latter also shows some metallic tints. Tibiae reddish, becoming brown distally including the tarsi. The genitalia of a male paratype before me shows the prongs slender and pointed.

Ephydrella[3] **novae-zealandica** Tonnoir and Malloch

1926. *Ephydra* (*Ephydrella*) *novae-zealandica* Tonnoir and Malloch, Rec. Cantb. Mus., III, p. 6, pl. 1, figs. 6-7.

The examination of a series of what I determine as this species, shows, in the absence of the posthumeral bristles and in the well developed internal subbasal spinose lobes on the genital prongs of the males, a close relationship to the species of *Dimecoenia*. However, in the presence of a distinct pair of prescutellar acrostichals and the lateral (not dorso-ventral) dilation of the male genital prongs, this species differs from all others of that genus. Considering these slight differences, we may treat the present species as representing a distinct genus, although I do not feel that this treatment would be warranted were it not that it had already been recognized as a subgenus and given a name.[4]

The type of this species is presumably a male, although not so stated, from Christchurch, New Zealand. I have a series of one male and four females from Otago, New Zealand, (Coll. Osten-Sacken), [Deut. Ent. Inst.].

The species consists of robust individuals, almost five millimeters in length; the upper surface of head and thorax brownish pollinose; mesofrons and mesonotum somewhat shining, scarcely metallic; the interdorsocentral opaque vittae very faint. Face brown and cheeks slightly lighter. Pleura brown, becoming grayish below. Abdomen uniformally metallic blue to green, slightly subdued by the whitish pollen.

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[3] *Ephydrella* Tonnoir and Malloch (1926) was erected as a subgenus of *Ephydra*, with *E. novae-zealandica* as the genotype, and was based on the absence of posthumeral bristles. *Ephydra aquaria* Hutton (1900) and *E. similis* Tonn. & Mall. (1926) were also included, but I rather suspect, from the form of the genitalia, that these species are not congeneric with the genotype.

[4] I do not consider our knowledge of this family sufficient to recognize subgeneric groupings.

Scutellum flat more or less transversely rugulose; of the male, somewhat elongate; of the female very elongate, the apical bristles becoming sublateral in consequence. Genital prongs of male well developed, with spinose subbasal, internal lobes; the prongs dilated laterally, broadest at middle (as well figured by Tonnoir and Malloch.).

Ephydrella spathulata new species

Very similar to *novae-zealandica*, but smaller; the head not so much longer than high; the mesonotum more shining with the interdorsocentral pollinose stripes more distinct. Scutellum convex, smooth, less elongate, and rounded apically, which characters are otherwise particularly noticeable in the female of that species. The genital prongs of the male are broader, dilated at apices.

♂. Halteres, squamae and base of wings, yellowish. Mid and hind tarsi reddish basally. Wings brownish; veins black.

Vestiture of dorsal surface of head, thorax and scutellum, brown; also of face above, the latter becoming lighter at oral margin and gray on cheeks and occiput. Pleura brownish above, whitish below and on metanotum and coxae. Mesofrons, interfoveal area, mesonotum and scutellum, shining metallic blue to purple, somewhat subdued on mesonotum by the brown vestiture, showing rather distinct opaque ochraceous interdorsocentral stripes. Abdomen metallic green to bronze, somewhat overcast with white pollen, slightly more dense on apical margins of tergites. Femora and tibiae whitish pollinose, almost obliterating the greenish ground color.

Head not much broader than high (as 40 : 30); in profile not longer than high. Cheeks about .33 height of head (as 8 : 30). Face projecting about .33 length of head (as 11 : 30). Scutellum convex, not longer than broad. Genital prongs of male dilated apically, the basal two-thirds slender.

♀. Similar to male but head slightly broader in proportion to height (as 45 : 30). Scutellum not more elongate.

Length, 4.5 mm.

Type.—♂; Queenstown, New Zealand. December 12, 1922. (Leon Cuetis). [U.S.N.M., no. 51099].

Paratypes.—8 ♀; topotypical. 3 ♀; Glenorchy, New Zealand. January 3, 1923. (F. S. Oliver). [U.S.N.M.].

PARACOENIA new genus

Differs from *Coenia* Robineau Desvoidy in greater dorso-ventral diameter of the head in proportion to its caudo-cephalic diameter; in the more extensive facial profile, abruptly humped above, separated medianly from the interantennal area by a distinct transverse sulcus; the facial series of six or more bristles each side; cheeks broader. Humeral bristles well developed and three postsutural dorsocentrals present. The species are more robust than those of *Coenia*.

GENOTYPE: *Paracoenia bisetosa* (as *Coenia bisetosa* Coquillett, 1902).

Here we also may include *Paracoenia fumosa* (as *Ephydra fumosa* Stenhammar, 1844) and *Paracoenia beckeri* (as *Coenia beckeri* Kuntze, 1897).

Paracoenia platypelta new species

Similar to *bisetosa* but the acrostichal setulae are in two distinct series, and the scutellum is flattened. Abdomen slender and unicolorous metallic bronze tone, slightly subdued by the pollinose vestiture.

Length, 4 mm.

Type.— ♂ ; Pine Lake, southern California. (Johnson). [U. S. N.M., no. 51110].

Paratype.— ♀ ; Topotypical.

Paracoenia fumosalis new species

Similar to our *bisetosa* but smaller (3.5 to 4 mm.) with undeveloped or very weak postocellar bristles; these bristles being not very much stronger than the surrounding setulae. The fifth abdominal segment of the male with the mesal ventral angle deeply cleft. Also very similar to *fumosa* Stenhammar of Europe but more shining; the fore femora of male with short hairs in the proximal portion of the anterior flexor series; the mid tibiae of male more incrassate in the present species. The ventral lobes of fifth tergite of the male also quite different in that species.

General color of the pollinose vestiture is yellow brown to dark brown, very sparce on the mesonotum and but slightly obscuring the shining surface. Noticeably smaller than *bisetosa,* darker and more shining with the mesonotal setulae very weak and sparce; the ventral lobe of the fourth tergite of the male deeply cleft at mesal angle, this angle not produced

tooth-like. Mid tibiae of male noticeably swollen, with the scopal pubescence well extended proximally. In the last two characters the present species differs from *Caenia turbida* Curran (1927).

Type.— ♂ ; Rockport, Massachusetts. August 28, 1913. (C. W. Johnson). [Boston Soc. Nat. Hist.].

Paratypes.—1 ♂ , 2 ♀ ; Topotypical. 4 ♀ ; Nantucket Island, July 13, 1926, (C. W. Johnson).

Philotelma alaskensis new species

More opaque than *P. nigripennis* (Meigen) with pale halteres.

Black including antennae, palpi and tarsi. Face, mesonotum and scutellum almost opaque, gray to ochraceous pollinose. Mesofrons shining, slightly metallic. Halteres yellowish. Abdomen polished black.

Length, 1.5 mm.

Type.— ♂ ; Anchorage, Alaska. June 6, 1921. (J. M. Aldrich). [U.S.N.M., no. 51103].

Paratypes. — 2 ♂ ?; topotypical. (Condition does not allow critical determination of sexes.)

PARASCATELLA new genus

Several species originally described and heretofore included in the genus *Scatella,* cannot now be allowed to remain there; nor can they, to be consistent, be referred to either *Lamproscatella* or *Neoscatella.* In these species the wings have the *Scatella*-pattern, but the facial bristles are all down-curved, without any strong up-curved bristle in the lower angle of the face; the antesutural dorsocentral is strong and the acrostichal series of setulae setae are more or less complete to base of scutellum, as in *Lamproscatella;* the setulae of the mesofrons are all reclinate; buccal bristle well developed and the lateral scutellar bristle as strong as the apicals.

GENOTYPE: *Scatella pilifera* Cresson, 1931.

Parascatella pilifera Cresson

1931. *Scatella pilifera* Cresson, Dipt. Pat. & S. Chile, VI, p. 114.

This species was originally described from a male collected at Bariloche, Rio Negro, Argentina. Before me are two males and

a female from Angol, Chile, collected by Bullock, January 1, [U.S.N.M.]. The female is not materially different from the male in general.

Parascatella triseta (Coquillett)

1902. *Scatella triseta* Coquillett, Jour. N. Y. Ent. Soc., x, p. 184.

Although not typical in that the faceial series contains several strong laterally curved bristles, the lower one is down curved, and on this character alone we may include this and the following species, provisionally in the present genus.

Parascatella marinensis new species

With the general habitus of *Scatella triseta* Coquillett, 1902, in possessing a well-developed antesutural dorsocentral, the acrostichal series complete postsuturally and its white face having the conspicuous dark spot on the hump; differing in its shining mesonotal disk and scutellum. These surfaces are very sparingly pollinose, the antesutural, interdosocentral stripes more pronounced; the abdomen subopaque, brown pollinose, sometimes quite glossy, narrowly grayish on apical lateral margins of the tergites; mesofrons more extensively shining and the intermediate frontorbital seta variable.

Type.—♂; Redwood Canyon, Tamulpias, Marin County, California. May 17, 1908. (E. T. Cresson, Jr.). [A.N.S.P., no 6525].

Paratypes.—4 ♂, 4 ♀; topotypical.

Parascatella melanderi new species

Very similar to *Scatella triseta* Coq. in having the strong antesutural dorsocentral and complete series of uniform, acrostichal setae. Differing in being more shining; the pollinose vestiture less dense; frons shorter and broader in proportion, with only the usual two frontorbitals, the intermediate seta much reduced, often very small. The wing-spots are larger and more distinct against a darker ground.

Pollinose vestiture less dense than in *triseta*, cinereous to brownish, including the entire face; mesofrons sometimes entirely opaque. Mesonotum and abdomen showing considerable gloss on disk, and there is some evidence of antesutural interdorsocentral vittae. The lateral and ventral surfaces not contrastingly lighter than those on the dorsum in the darker individuals although always cinereous on the pectus. Face unicolorous, without the darker spot on the hump. Cilia of squamae brownish. Wings

darker with the spot in submarginal cell large, generally occupying entire width of cell; the veins yellowish to brownish, including costa. Tarsi sometimes inclining to paleness.

Frons generally shorter than in *triseta*, about .3 as long as broad; the two frontorbitals as near each other as they are to the inner-verticals; the intermediate seta very small. Oral cilia very long. Mesonotal setulae stronger than in *triseta*. Scutellum more convex with the lateral bristle more removed apically. Abdomen more elongate.

Type.—♂; Tacoma, Washington. [A.N.S.P., no. 6526].

Paratypes.—4 ♂; Tacoma, July 23, 1915. (A. L. Melander). [Melander Colln.].

NEOSCATELLA Malloch

1933. *Neoscatella* Malloch, Bishop Mus. Bull., no. 114, p. 9. (Feb. 27.)

GENOTYPE: *Neoscatella atra* Malloch, 1933. (Orig. desig.).

This genus was proposed for the reception of an Australian species, and is distinguished from *Scatella* by the presence of a antesutural dorsocentral. This character is very positive. I have seen no variation. In addition, we find that the lateral seta of the scutellum, is typically strong and basal, but this character varies, becoming a weak curved subapical setae as in *Scatella*. As in that genus the series of acrostichal setae are absent post-suturally, or at least irregular, but always a strong pair at the suture.

The following North American species will fall in this genus:

Neoscatella setosa (Coquillett)

1900. *Scatella setosa* Coquillett, Proc. Wash. Acad. Sci., II, p. 462.
1915. *Scatella intermedia* Cresson, Ent. News, XXVI, p. 72. (New syn.)

Setosa was originally described from Alaska; *intermedia* from California. Since examining a good series of the latter from Washington, Idaho and Alaska, I felt certain that it was a synonym of *setosa*. Mr. Charles T. Greene of the United States National Museum has kindly compared my specimens with the type *setosa* and found them conspecific.

Another North American species belonging here is *Neoscatella obscuriceps* (*Scatella*, Cresson, 1915). Also the following species,

known to me, originally described under *Scatella,* belong here, and are given the new combination: *Neoscatella furens* (Cresson, 1931), *N. ignaria* (Cresson, 1931), *N. gestiens* (Cresson, 1931), *N. gregaria* (Cresson, 1931), all from South America; *N. warreni* (Cresson, 1926), *N. terryi* (Cresson, 1926), *N. sexnotata* (Cresson, 1926), *N. hawaiiensis* (Grimshaw, 1901), *N. bryani* (Cresson, 1926), all from Hawaii; *N. silacea* (Loew, 1860), *N. variofemorata* (Becker, 1903) of Europe; *N. vittathorax* (Malloch, 1925) and probably *N. immaculata* (Malloch, 1935), from Australia.

Neoscatella victoria new species

Similar to *Scatella vittathorax* Malloch, 1925 in the thoracic chatotaxy, but the wing pattern is quite different.

Entirely black except the pale halteres and dusky squamae.

Rather sparingly shining; pollinose vestiture brown varied with cinereous. Frons with only the lateral areas of mesofrons polished; vestiture brown. Face sparingly yellow brown; foveae, parafacialia and cheeks lighter. Mesonotum subopaque with antesutural grayish stripes and same color on humeri; otherwise sparingly brown dusted including scutellum. Pleura more opaque, gray, with mesopleura brown. Abdomen more shining with gray marginal bands on tergites.

Head much broader than high. Frons very broad; about destitute of setulae, but the usual bristles well developed. Face about as broad as long; interfoveal hump strong, with the usual pair of divergent setae; the facial series of four to five bristles, the lower one strong and dorsoclinate. Cheeks very narrow, scarcely one-half width of third antennal segment. Antesutural acrostichal and antesutural dorsocentral very strong; no postsutural acrostichals; otherwise setulae very sparce. The lateral, curved scutellar seta situated about midway to base. Wing veins slightly undulating at the diluted spots.

Length, 2.5 mm.

Type.—♀; Victoria, Australia. 1888. [A.N.S.P., no. 6514].
Paratype.—1 ♀; topotypical.

Lamproscatella cephalotes new species

Very similar to *L. dichaeta* (Loew, 1860) but larger with the bristles and setae stronger and the mesofrons opaque. Otherwise also differing as follows:

More uniformally cinereous with slight brown tone on mesonotum, scutellum and abdomen. Frons uniformally cinereous, more quadrate than in *dichaeta;* mesofrons with at most slightly metallic undertone, about as broad as long, pointed, defined by slightly relieved lateral margins, with a few strong reclinate setulae. Face distinctly longer than broad; the facial series with a strong ventro-laterally curved bristle on the interfoveal hump besides the dorso-laterally curved bristles in the lower part. Mesonotum with the long prescutellar acrostichals extending to or beyond mid-scutellum. Lateral seta of scutellum removed more basad. The dorso-clinate seta of anterior angle of mesopleura very strong. Although there are apparently no additional setae than are present in *dichaeta*, their greater size gives that impression; this applies particularly to those on the antennae and legs, and the anterior frontorbital seta almost assumes bristle-like proportion. The tarsi are somewhat yellowish.

Length, 2 to 2.5 mm.

Type.—♂ ; Salt Lake, Utah. June 26. (H. S. Barber). [U.S. N.M., no. 51102].

Paratypes.—3 ♀ ; topotypical.

A female from 12 miles northwest of Lusk, Wyoming, July, [Univ. of Kansas] is less strongly bristly than the type series, but the opaque mesofrons is characteristic.

Lamproscatella nivosa new species

Similar to *dichaeta* (Loew) but entirely white to cinereous with sericeous-white face; tarsi entirely yellow except apices and all bristles and setae reduced in strength. Frons entirely opaque including ocellar tumor. Mesofrons broader than long, broadly rounded anteriorly, reducing the frontalia to anterior wedges; the reclinate setulae sparce and very weak; no strong anterior orbital seta. Face large, convex, subhemispherical without interfoveal hump; in profile strongly convex, conjoining with that of the frons in a straight, oblique contour, without any indication of the facial hump; foveae very shallow. Facial setulae very weak, the series of bristles limited to two dorso-laterally curved and one to two ventro-laterally curved setae; parafacials quite broad. (Antennae missing.) Prescutellar acrostichal pair not conspicuous. Wings rather lactaceous with veins yellowish basally.

Length, 2.2 mm.

Type.—♂ ; 40 miles north of Lusk, Wyoming. July, 1895. [Kansas Univ. Colln.].

This is the only specimen known to me of this species.

LIMNELLIA Malloch

1925. *Limnellia* Malloch, Proc. Linn. Soc. N. S. Wales, L, p. 331.
1930. *Stictoscatella* Collin, Ent. Mon. Mag., LXVI, p. 133. (New syn.)
1930. *Eustigoptera* Cresson, Trans. Am. Ent. Soc., LVI, p. 126. (New syn.)

The salient characters of this genus are the presence of but one laterally-curved frontorbital, small medifacies, absence of both the antesutural dorsocentral and the sutural pair of acrostichals and the normal extension of the costa to the fourth vein.

GENOTYPE: *Limnellia maculipennis* Malloch, 1925. (Orig. desig.) [Australia].

Although I have not seen Malloch's species I am convinced that it is very similar to *fallax* of Europe and my new species here described. These species are certainly congeneric with *Notiphila quadrata* Fallen, 1813, the genotype of *Stictoscatella* Collin and *Eustogoptera* Cresson.

The following are the known species of this genus:

Limnellia fallax (Czerny)

1903. *Scatella fallax* Czerny, Verh. Z.-B. Gesell. Wien, LIII, p. 239. [Austria; in hot bed "Mustbeeten".]
1910. *Scatella pauciguttа* Strobl, Mitt. Nat. Ver. Steyerm., XLVI, p. 208. [Austria.]
1926. *Scatella pauciguttata* Becker, Lindner Fl. Pal. Reg., Ephyd., p. 81.
1926. *Scatella fallax* Becker, Lindner Fl. Pal. Reg., Ephyd., p. 83. (Sp. ?)
1930. *Stictoscatella fallax* Collin, Ent. Mo. Mag., LXVI, p. 139. (Gen. comb.) [England.]
1930. *Eustigoptera pauciguttata* Cresson, Trans. Am. Ent. Soc., LVI, p. 127. (Gen. comb.)

Becker (1926) recognized *pauciguttata* and cites *fallax* as not known to him, but mentions it as possibly synonymous with *pauciguttata*.

This species belongs to a group having broad short wings, the marginal cell with three diluted spots and no round isolated spots in the submarginal nor in the first posterior. The present species has the palpi, halteres and tarsi yellow; face whitish without any distinct transverse brown band. Known only from Austria and England.

Limnellia maculipennis Malloch

1925. *Limnellia maculipennis* Malloch, Proc. Linn. Soc. N. S. Wales, L, p. 332, fig. 17.

This species was described from a female from Sydney, New South Wales. Its description very well fits my specimens of *fallax*. The wing maculation as figured is typical of this group.

Limnellia anna new species

Similar to *fallax* but the halteres, palpi and tarsi dark, and the face with a distinct transverse brown band.

Entirely black including palpi and tarsi; the halteres and lower part of third antennal segment sometimes slightly paler.

Opaque brown to blackish pollinose, variegated with cinereous and ochraceous. Face with oral margin narrowly whitish; a transverse brown band just below and including the facial series of bristles; often another brown transverse band across the interfoveal carina; otherwise, including parafacials the face is cinereous. Cheeks and postbucca whitish. Mesonotum with an interacroscithal stripe, abbreviated anteriorly, two interdorsocentral stripes, abbreviated posteriorly, a stripe incliding the humerus and notopleura and an irregular postsutural extradorsocentral stripe, cinereous. Pleura mottled with cinereous. Abdomen polished black, obscured on dorsum basally.

Wings short and broad, with the second costal section at most three times as long as third; posterior crossvein noticeably oblique. The wing strongly infuscated especially towards costa, with numerous irregular diluted spots between the veins: three in marginal cell beyond first vein, three to four in submarginal, four to five in first posterior, two to three in discal, two in second posterior, and several below fifth vein.

Length, 1.75 mm.

Type.—♀; Bussey Institution, Boston, Massachusetts. September 6, 1924. (C. R. Kellogg; in greenhouse). [Boston Soc. Nat. Hist. Colln.].

Paratypes.—2 ♂, 1 ♀; topotypical.

Limnellia quadrata (Fallen)

1813. *Notiphila quadrata* Fallen, K. Svensk. Vet. Akad. Handl., XXXIV, p. 255. [Sweden.]

1839. *Scatella quadrata* Haliday, An. Nat. Hist., III, p. 410. [Gen. comb.]

1930. *Stictoscatella quadrata* Collin, Ent. Mo. Mag., LXVI, p. 133. [Gen. comb.]

1930. *Eustigoptera quadrata* Cresson, Trans. Am. Ent. Soc., LVI, p. 127. [Gen. comb.]

This Holarctic species is known to me in North America from Alaska, Washington, Idaho and Oregon. It is typical of a group of species in which the wings are long and narrow, resulting in the second costal section being four to five times as long as third. The present species is distinguished by the wing maculation, there being usually more than three spots in the marginal cell; those in the submarginal and first posterior are large, and more or less divided by dark spots contiguous with third vein, two in the first posterior being very dark and conspicuous.

Limnellia sejuncta (Loew)

1863. *Scatella sejuncta* Loew, Berl. Ent. Zeit., VII, p. 326. (Cent. IV, 99.) [Sitka.]

Very similar to *quadrata* but with the two dark spots in the first posterior cell round and not truly contiguous with the third vein although nearer the third than to the fourth; and there are similar spots in the submarginal.

This species is known to me only from California.

Limnellia stenhammari (Zetterstedt)

1846. *Ephydra stenhammari* Zetterstedt, Dipt. Scand., V, p. 1842. [Sweden.]
1860. *Scatella stenhammari* Loew, Neue Beitr., VII, p. 40. [Gen. comb.]
1930. *Stictoscatella stenhammari* Collin, Ent. Mo. Mag., LXVI, p. 139. [Gen. comb.]
1930. *Eustigoptera stenhammari* Cresson, Trans. Am. Ent. Soc., LVI, p. 128. [Gen. comb.]

Another Holarctic species having the diluted spots in the wings more rectangular in shape, well separated, at most showing slight tendency to division in the first posterior. There are some slightly darker spots in the first posterior along the third vein but these are in the infuscated interspaces.

A species with quite extensive distribution in North America. Known to me from Washington, Idaho, Ontario, Massachusetts, New York, New Jersey, Pennsylvania and Illinois.

Scatella pulla Cresson

1931. *Scatella pulla* Cresson, Dipt. Pat. & S. Chile, VI, p. 109.

This species was originally described from four males collected at Castro, Isle de Chiloe, Chile. Before me are four males and

a female from the same locality, collected December, 1926, by Shannon, [U.S.N.M.]. The female agrees with the male except that the face below the facial series, and the facial hump are brown; above, including the parafacialia and foveae, is cinereous.

Scatella arizonensis new species

Very similar to *S. obsoleta* Loew (1861) but the face is light gray and the wings in the males lack the costal callosity.

Black including the palpi and tarsi. Halteres yellow. Entirely opaque or the mesofrons slightly shining laterally. Pollinose vestiture of frons and mesonotum cinnamon-brown; face and cheeks contrastingly whitish gray; occiput, lower part of pleura, abdomen and legs cinereous. Wings brownish with faint diluted spots arranged as in *stagnalis;* no massive thickening of the costa before cleft at first vein in the male.

Structurally similar to *S. obsoleta* Loew.

Type.—♂ ; Pinery Canyon, Chiricahua Mts., Cochise County, Arizona, 6500 feet alt. June 21, 1919. (W. Stone). [A.N.S.P., no. 6527].

Paratypes.—4 ♀ ; topotypical.

Scatella picea (Walker)

1849. *Ephydra picea* Walker, List Dipt. Br. Mus., IV, p. 1105.
1862. *Scatella lugens* Loew, Mon. Dipt. N. Am., I, p. 171. [New syn.]

The synonymy of *S. lugens* is established after my having seen the type of that species in the Museum of Comparative Zoology, and after comparisons of homotypic material had been made with the type of *picea* in the British Museum.[5]

Scatella obscura Williston

1896. *Scatella obscura* Williston, Trans. Ent. Soc. London, 1896, p. 403. [St. Vincent.]
1897. *Scatella stagnalis* Williston (not Fallen), Kans. Univ. Quart., VI, p. 5. [Brazil.] (Syn. *obscura.*)
1918. *Scatella stagnalis* Cresson (not Fallen), Trans. A. Ent. Soc., XLIV, p. 66, pl. 3, fig. 22. [Costa Rica.]
1934. *Scatella laetifica* Cresson, Trans. Am. Ent. Soc., LX, p. 217. [Argentina.] (Syn. nov.)

[5] These comparisons with Walker's type were kindly made for me by Maj. E. E. Austen of the British Museum and by Dr. P. P. Calvert. They gave me such copious notes that I am able to establish beyond doubt this synonymy. My thanks and appreciation for these services are here acknowledged.

Through the kindness of Mr. John Smart of the British Museum (Natural History), I had the opportunity to examine a paratype ("cotype" ♀) of this species, and find it is what I have been considering *stagnalis* from Central America. Williston, (1897) considered his *obscura* a synonym of *stagnalis*. The form described as *laetifica* from Argentina is apparently only a more shining variety as I cannot find any satisfactory differences. Some of the records of *stagnalis* from South America: Becker's from Ecuador [6] and Hendel's from Argentina and Bolivia [7] are probably of this species.

As I understand this species it differs from *stagnalis* in the more shining appearance, the pollinose vestiture being very sparce and of a more uniform brown color, with little or no tendency towards gray or olive; no or very little mesonotal vittation. The frons is distinctly shorter than in that species, being about three times as broad as long (between outer-verticals and anterior to postocelli.) In *stagnalis* the frons is longer, about two and one-half times as broad as long. The face in *obscura* is uniformally brown pollinose, not tending towards olivaceous. Genitalic study will probably throw some light on the status of the species of this group.

To the above records from Costa Rica and Argentina, I add this species from:

PARAGUAY, Asuncion, June 1, (Vezenyi). San Bernardino, July 31, (Fiebrig). [Hungary Nat. Mus. Colln.; 2♂, 2♀.]

Scatophila exilis new species

This is the smallest species I have seen belonging to the genus. In color and color-pattern it resembles *S. cribrata* (Stenhammar) 1844, but the antesutural dorsocentral is absent.

Black, including the tarsi. Halteres yellow, palpi sometimes diluted.

Opaque, blackish brown and gray pollinose; abdomen scarcely grayish, with apex more or less shining. Frons dark, with quite differentiated frontalia. Face dark, with foveae, orbits and cheeks, grayish. Mesonotum with the usual gray stripes, narrow. Scutellum dark, with basal and apical gray spots. Pleura with some gray, especially ventrally.

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[6] Arc. Merid. Equat. Am. Sud., x, p. 205, (1919).

[7] Konowia, IX, p. 153, (1930).

Face of the sexes similar, with distinct interfoveal hump bearing a pair of strong, diverging setae and another stronger pair below. Oral cilia of three strong bristles each side. Second antennal segment of male without any long hairs on mesal surface. Antesutural dorsocentral absent, represented by one to two setae, not as strong as the well developed sutural acrostichal pair; no postsutural acrostichals.

Wings strongly infuscated, with three distinct diluted spots in submarginal, none in marginal, about four in first posterior, two in second posterior, one or two in discal and two in anal area.

Length, 1 mm.

Type.—♂; Boulder, Colorado. (W. E. Watkins). [U.S.N.M., no. 51297].

Paratypes.—2♂, 4♀; topotypical.

Scatophila parva new species

Very similar to *exilis* but the wing spots in the first posterior cell are rounded, not contiguous with the veins, and the postsutural acrostichals are strong, but not confined to a posterior cluster; and the face is much narrower.

Black; halteres yellow, bases of mid and hind tibiae slightly diluted.

Opaque; at most slightly glossy on mesonotum and more so ventrally and on abdomen. Pollinose vestiture dark brown, variegated with gray markings; ventrally sparingly grayish. Wings strongly infuscated, with normal pattern of diluted spots: none in marginal, three each in submarginal and first posterior; those in the former contiguous with the veins, in the latter rounded, not contiguous with veins; other spots as usual.

Frons dark, with mesofrons noticeably black. Face yellowish gray becoming gray in foveae at the orbits and on cheeks. Mesonotal gray pattern poorly developed, only as two interdorsocentral antesutural and a small extradorsocentral spots near suture. Basal and apical spots of scutellum faint. Abdomen uniformally dark, at most with faint gray spots on ventral lobes.

Head scarcely higher than long, much broader than high. Eyes oblique. Frons much broader than long; in profile, flat and oblique, orbits distinctly converging. Face about .33 width of head, distinctly longer than broad; in profile prominent, with distinct hump; the interfoveal carina prominent and bearing a pair of divergent setae with a similar pair of stronger bristles below same; oral cilia of about six strong bristles. Cheeks linear. Antesutural dorsocentral absent; sutural acrostichals rather strong, also two widely separated pairs of postsutural acrostichals. Scutellum longer than broad, flat. Abdomen rather elongate; fifth tergite much longer than fourth; genital segment well developed.

Legs with rather stout femora; bristles and setae sparce. Wings elongate; veins slightly undulated at spots.

Length, 1.1 mm.

Type.— ♂ ; Buenos Aires, Argentina. October 21, 1926. (F. & W. Edwards). [British Mus. N. H.].

Scatophila tuberculosa new species

A species similar to the Palaearctic *S. laevigata* (Loew) in its tuberculose face in the male sex, but quite different in the form of the tubercle as well as in other respects. The female sex is unknown to me.

Black; palpi and hind tarsi only showing any dilution; halteres yellow.

Opaque; with shining abdomen, especially the fifth tergite. The pollinose vestiture olive brown, variegated with greenish gray, becoming light gray below. Frons uniformly dark except the slightly grayish frontalia. Face dark, with gray foveae, parafacials and cheeks. The usual mesonotal markings present but not sharply defined; the interdorsocentral stripe evanescent anteriorly. Mesopleura more or less dark. Scutellum dark, with basal and apical spots. Abdomen showing some slight gray on apical margins of tergites. Femora and tibiae slightly grayish. Wings infuscated; the spots rather well marked and slightly whitish. Marginal with basal spot, also a similar one in submarginal; first posterior with two distal besides the usual median and basal spots, otherwise the maculation is normal.

Head about as high as long, much broader than high. Eyes round. Frons much broader than long. Face about as long as broad, oblique in profile, slightly convex below interfoveal carina; epistoma very prominent and pointed; interfoveal carina and fovae weak; a well-marked, black, elongate, pubescent tuberculose development at epistoma; pile and setae of face very sparce, and only two rather stout ventro-mesally curved bristles each side; no oral cilia. Cheeks very narrow.

Antesutural dorsocentral absent; acrostichals weak, inconspicuous postsuturally. Abdomen broad, rotund; fifth tergite more than twice as long as fourth; genital segment large. Legs with femora moderately stout. Wings elongate; veins somewhat undulated.

Length, 1.5 mm.

Type.— ♂ ; Atherton, Missouri. October. (C. F. Adams). [A.N.S.P., no. 6520]. This specimen deposited in the collection by the kindness of Dr. Adams.

Scatophila adamsi new species

In this species we have the dissimilar facial structural in the two sexes as in *S. caviceps* (Stenhammar), but carried to the extreme where the true oral margin in the male is wanting medianly, caused by the deep emargination of the epistoma extending to and partly including the median membraneous area. Thus the bristles and pile are forced into lateral tufts, and are very long, directed ventrad and mesad, almost decussating.

Black; palpi, halteres, mid and hind tarsi, yellow.

Opaque; brown, ochre and gray pollinose; abdomen subopaque, grayish, with bases of tergites brownish. (Frons and face of male type encrusted with a white deposit, thus obscuring the color and minute details.) Frons of female unicolorous ochraceous; face of same sex uniformly lighter, more yellowish. Cheeks and postbucca gray. Mesonotum ochraceous, with usual markings faint, grayish, especially antesuturally. Pleura gray with a brown spot in upper and lower posterior angles. Legs grayish.

Wings infuscated, yellowish; spots rather marked and slightly whitish; none in marginal, three in submarginal and in first posterior and three more below vein five.

♂: Head about as high as long, much broader than high. Eyes round. Frons much broader than long; frontalia not well marked. Face much broader than long. Profile very little projecting, very deeply emarginate at epistoma to the median membraneous area; no distinct oral margin nor oral cilia; all bristles confined to lateral clusters of three to four; interfoveal carina strong, ventro-laterally divaricating, emphasized by the depressed foveae and median membraneous area; these carinae sparingly pilose, the pile becoming longer towards the lateral tufts of long bristles; these latter inclined ventro-mesally, almost decussating. Cheeks about .2 height of head. Second antennal segment without mesal hairs.

Antesutural dorsocentral represented by setulae not stronger than the four to five pairs of uniform acrostichals which are sparingly present postsuturally. Abdomen rather narrow; fifth tergite much longer than fourth; genital segment well developed. Legs slender; bristles short. Venation normal; veins slightly undulated.

♀: Similar but the face about as broad as long, slightly convex in profile; the medifacies and carina sparingly setulose, and a cluster of three to four ventroclinate bristles, some long, at lower angle along the oral margin. Abdomen broader, ovate.

Length, 1.75 mm.

Type. — ♂; Atherton, Missouri. June. (C. T. Adams). [A.N.S.P., no. 6521].

Paratypes.—1 ♀ ; topotypical. 1 ♂ ; Savana, Illinois, June 13, 1917. 1 ♀ ; Freeport, Illonis, July 2, 1917.

The sexes are associated on their similarity in color and wing pattern. The Illinois series is considered paratypic on the same basis. The type and female topotype kindly deposited in the collection of The Academy of Natural Sciences of Philadelphia by Dr. Adams.

Scatophila bisignata new species

A species simulating *cribrata* in having a strong antesutural dorsocentral, but apparently not related as the face of the sexes are different, simulating *caviceps* in this respect. It has two diluted spots in the marginal cell.

Black; palpi, halteres and base of tarsi, pale yellow.

Entirely opaque; pollinose vestiture ochraceous brown and gray. Frons uniformly colored except some gray along anterior and lateral margins. Face gray, with brown spots at base of bristles. Cheeks and occiput gray. Mesonotum brownish, obscurely marked with gray in the usual pattern. Scutellum brownish with basal and apical gray spots. Abdomen grayish medianly and with brown dots at base of setae which laterally coalesce into brown areas. Femora and tibiae grayish.

Wings with brownish infumation; the diluted spots quite well marked, in the usual pattern, with additional spots. These latter are noticeable in base and apex of marginal, base of submarginal and median in first posterior; the inferior area with well marked, irregular spots, also the basal area diluted.

♂ : Structurally similar to *caviceps*, but the face is slightly carinate; in profile but slightly concaved; interfoveal carina with a few ventrally curved setulae, not exactly pilose; also a few strong ventro-mesally curved setae or bristles below foveae and two to three strong bristles each side at oral margin.

Antesutural dorsocentral strong; also two pairs of strong acrostichals at sutural region almost aligned with the dorsocentral, and another weaker pair about aligned with postsutural dorsocentral.

Some wing veins distinctly undulated.

♀ : Similar but face normal, with median the pair of divergent bristles very strong.

Length, 2 mm.

Type.—Male; Kennewick, Washington. June 7, 1910. (A. L. Melander). [A.N.S.P., no. 6522].

Paratypes.—2 ♀ ; topotypical. 2 ♂ ; Omak, Washington, May 19, 1910, (A. L. Melander).

Scatophila disjuncta new species

Very similar to *S. quadriguttata* (Meigen) 1830, and possibly may prove to be conspecific. I do not have a large enough series of the European species to note the possible variation. The series of the present form show constant differences from that of the European species before me in having the abdomen more uniformally colored; the dark bases of the tergites are more sharply defined and the fifth tergite of the male shows but slight gloss. A more densly whitish species than *caviceps,* with conspicuous white scutellum; and the second antennal segment has long pile on mesal surface.

Black including palpi; halteres yellow.

Opaque, densely whitish gray including face, cheeks, pleura, venter and legs, with frons and mesonotum more or less brownish. Frons uniformly colored, seldom showing any differentiated frontalia; the mesofrons outlined by the minute marginal, mesally inclined, setulae. Face sometimes showing median discoloration. Mesonotum marked with antesutural interacrostichal and postsutural interdorsocentral brown areas; also the lateral margin of scutellum and dots at bases of bristles and setae brown; all of which are sometimes scarcely defined or are obscured by a general ochraceous suffusion. Abdomen glaucous gray, generally with tergites two to three, and four and five except lateral angles, blackish, however subject to considerable variation but generally always discernable.

Wings infuscated, becoming slightly more diluted towards inferior margin; marked with diluted, whitish areas and spots as follows: Broad transverse band over costal cell including base of submarginal (sometimes absent); median and apical spot in submarginal, former generally narrow, seldom quadrate, latter sometimes indistinct; basal, median and apical spots in first posterior, first and last generally faint; apical spot in discal; one or two in second posterior and some spots in anal area.

♂ : Structurally similar to *caviceps.* Head distinctly higher than long. Eyes round. Frons noticeably broader than long. Face about as broad as long; in profile concaved; interfoveal carina rather strong; only a small portion of the median area membranous; pubescence and pile rather long, the two to three bristles each side weak but differentiated. Cheeks about .2 height of head. Second antennal segment with long hairs on mesal surface, reaching to about middle of third segment. Mesonotal acrostichals not conspicuous postsuturally but those at suture rather stronger; no antesutural dorsocentral.

♀: With face normal, in profile oblique, with the usual pair of divergent setae on interfoveal hump; medifacies otherwise sparingly setulose with about three bristles each side along oral margin.

Length, 1.5 to 1.75 mm.

Type.—Male; Yosemite Valley, California. May 22, 1908. (E. T. Cresson, Jr.). [A.N.S.P., no. 6523].

Paratypes.—5 ♂, 8 ♀; topotypical.

Scatophila arenaria new species.

A more robust and more uniformally whitish species than *disjuncta,* with almost a brownish postocellar stripe and some median discoloration of mesonotum. No lateral brown on scutellum nor darkening on abdomen; sometimes there is a strong suffusion of ochre over frons and mesonotum, but the abdomen seldom showing discoloration. The wing infuscation is more yellowish and the median diluted spots in submarginal large, quadrate, sometimes broader; a very marked character.

Structurally the head is about as high as long in the male; distinctly longer than high in the female; frons noticeably longer than in *disjuncta,* the frontorbitals situated much nearer the innerverticals; face of male but slightly convex, without distinct median membraneous area; the bristles and pile more scattered, the former not markedly differentiated.

Length, 1.75 mm.

Type.—Male; Ilwaco, Washington. July 1917. (A. L. Melander; on beach). [A.N.S.P., no. 6524].

Paratypes.—4 ♂, 7 ♀; topotypical.

A topotypical series of six males and twenty-six females I am not considering paratypes.

DESCRIPTIONS OF NEW SPECIES OF THE GENUS SPHEGINA WITH A KEY TO THOSE KNOWN FROM NORTH AMERICA

(SYRPHIDAE; DIPTERA)

BY FRANK M. HULL

University, Mississippi

Plate XV

The present study of the genus *Sphegina*, has been offered as a means of aiding in the identification of the flies of this group. In spite of the discovery in recent years of so many interesting characters and species there seem to be additional undescribed forms and the entire assembly of species is confused. In the key presented below an effort has been made to arrange the species of the genus somewhat differently and to discover new characters.

Those species allied to *infuscata* Loew and comprising the short, thick-petiolate members of the genus seem singularly lacking structural characters. There are without doubt three or more species which have been placed under this name. The imagines are abundant in most damp forest sections in the more northern parts of the country. I have myself collected on different occasions thirteen species. There seems to be a peculiar predisposition towards tenerality within the group. Of the material studied seventeen percent of the specimens show marked tenerality and forty percent of them exhibit this condition slightly. Fifty-eight percent are males.

The genus includes both short, thick, and long, slender, petiolate forms, but so many are the gradations between, that but little use can be made of it. The armature of the fifth sternite contains useful characters, as does the character of the hind

femora and tibiae. There are groups with long-produced-face and those having a short face, species with base of arista swollen, others slender. The concavity of the upper occiput with double pollinose spots are more or less characteristic of all *Sphegina*.

I wish to thank Mr. E. T. Cresson, Jr., who kindly loaned the undetermined specimens of *Sphegina* in the Academy collection, together with other Syrphidae, the latter of which were reported on in a previous paper.[1] I also wish to thank Dr. C. H. Curran, who has kindly loaned material in this genus; and the late Dr. J. M. Aldrich for the loan of undescribed forms in the U. S. National Museum. My thanks are also due to several gentlemen for the use of their private collections. The writer was afforded the privilege of studying the specimens in the private collection of Dr. R. C. Osburn; as well as the private collection of Dr. J. R. Malloch, who made possible the examination of his types. I am also indebted to the late Professor J. S. Hine, whose private material was studied (now in the Ohio State University Museum.) All of these gentlemen have greatly aided in making this contribution possible.

Sphegina pluto new species

This species is peculiar in many respects. It is closely allied through the heavy pilosity, produced face and the type of armature of the hind femora, to *S. infuscata* Loew. It is very distinct from that species, yet differing in such ways that lend themselves poorly to comparison. So far as ready recognition is concerned, its uniform black color, in which it is unique, should serve very well. It may be distinguished thus from all other North American forms.

Male: Everywhere shining black. The only suggestion of lighter color occurring in the faintly reddish brown, present narrowly on the basal area of the fore, middle and hind tibiae and the very slight trace of it upon the apices of the fore and middle femora. The pile on the lower occiput and behind the cheeks is light. The front is not quite as wide as the length of the arista, very heavily and unusually long pilose, the longest pile occurring one-third of the distance down from the vertex. Arista not especially long, not noticeably pubescent.

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[1] These Transactions, LIV, pp. 139-148, (1930).

The dorsum of the thorax like the front is heavily long pilose. The pile of the thorax, the front and scutellum of about equal length. The margin of the scutellum is covered with many long, bristly, black hairs, the longest nearly as long as the length of the scutellum. The pile of the disk is but little shorter than the bristles of the margin.

The sides of the first and second and to the middle of the third abdominal segment with long white pile tinged with yellowish. This pile may be longer than that of the scutellum. On the third segment they grow shorter in length and upon the sides of the fourth segment there are abundant short, black hairs, rather stubby and appressed. The second abdominal segment is just a little less than twice as long as wide, third segment as wide as long, narrowest posteriorly. The sternites, except the first, bare. Fore and middle tibiae and femora with rather long, dark-colored pile. Hind metatarsus twice as long as next segment. Hind femora quite long and unusually slender, the rows of black spinules on under surface exceedingly numerous but shorter and more stubby than usual and reach in undiminished length a longer distance toward base of femora, beginning, in fact, almost at the base of the femur itself. Wings large, decidedly of the wide type in this genus; distinctly infuscated, more so on the anterior half and with a conspicuous brown stigma.

Length, 8 mm.

Type.—Male; Lowe's Inlet, British Columbia. (T. Kincaid; Harriman Expedition). [Canadian National Collection].

Paratype.—♂; Parase Springs, California, February 26, 1923, (L. S. Sleyia), [U. S. National Museum]. In damaged condition.

Sphegina cressoni new species (Pl. XV, fig. 9)

A fairly large species related to *S. armatipes* Malloch. The face is much more strongly produced and pale yellow in color. The posterior segments of the abdomen are not swollen as in *armatipes*. The species has a strongly pubescent arista, sharply thickened at base.

Male: Front and vertex black, feebly shining, clothed with very short, appressed silvery hairs. Upper occiput strongly excavated with oblique, oval, pollinose spots unusually distinct. Antennae dark brownish black; arista lighter brown, sharply and strongly thickened at base and unusually long pubescent along its whole length. Whole face and cheeks, the latter edged with brown, of a yellowish white, the facial prominence very conspicuous and the distance from eye margin to lower occiput unusually great.

Thorax and scutellum shining black, clothed with short, pale, appressed pile, the latter with two slender bristles in the middle.

Abdomen mainly shining light brown, the second and third segments each darker in color on their posterior halves; fourth segment entirely shining black save for a narrow brownish yellow posterior border. Hypopygium shining black. The point of greatest constriction lies just behind the anterior margin of the second segment. The posterior margin of second and the anterior margin of first segments about equally wide. The fourth segment three times as wide as the most slender part of the abdomen. The fourth sternite is dark brown, lighter posteriorly with nearly smooth entire posterior edge, but with a blunt angle on the insect's right side from below.

Legs pale yellow, hind femora apically, and basal joint of hind tarsi, brownish. Spinules of hind femora black, the wings hyaline with a faint grayish ring. Halteres entirely pale yellow.

Length, 7 mm.

Type.—Male; Mt. Rainier, Washington. July 10, 1926. (Frank M. Hull). [Acad. Nat. Sci. Phila., no. 6519].

Paratypes.—1 ♂; data as of type. 1 ♂; Glacier, British Columbia. Paratypes in author's collection.

Sphegina brachygaster new species

Male: Front and vertex black, the former obscured by dense brownish yellow pollen or pubescence, both clothed with sparse light yellow hairs, which are much longer than those found in the average *Sphegina*. In length they are about half or two-thirds of the width of the third antennal joint. Antennae brown, the third joint and arista light yellowish brown; last joint rather large; the arista not noticeably thickened at base, rather imperceptibly pubescent. Face below antennae short, the projection angular but obtuse, blunt, pale yellow in color with pale yellow pubescence, in length about two-thirds the length or less of the antennae. Cheeks brown, with no perceptible production of cheeks, and lower occiput below the lower eye margin.

Thorax shining black, with pale brownish pubescence and rather long thick golden hair. Scutellum and pleurae similar in color and vestiture to the thorax.

Abdomen entirely light brownish yellow, glossy. The hypopygium glossy dark brown, short pale pilose. Fifth sternite light brown, shining, with short pale hairs, without spinules or spiculate hairs.

Legs light orange yellow, a small pre-apical spot on hind tibiae, and hind tarsi light brown. First joint of hind tarsi quite enlarged. Wings with a faint yellowish brown tinge. Posterior margin of the fifth sternite with a small median incisure into the chitin without membranous replacement.

Length, 6 mm.

Type.—Male; Ithaca, New York. (J. C. Buys). [Collection of the author].

Sphegina perplexa new species

Closely related to the *infuscata* group by the shaggy vertex and but little petiolate, broader abdomen. It differs in the bicolored legs, especially the hind femora and bicolored abdomen and in these respects resembling the other groups.

Male: Front and vertex feebly shining black, with black, rather abundant hairs in length nearly if not quite equal in length to the breadth of third antennal joint. Antennae dark brown, the third joint small; arista short, thickened gradually but strongly at base, and very noticeably pubescent. Projection of face below the antennae strong and acute, reaching from eye margin at least the length of the antennae. Face and cheeks shining dark brown, the former more especially with light-colored pubescence or pollen. The lower part of face and occiput projects very considerably below the lower eye margin. Eyes bare save microscopically near the side of the front.

Thorax, pleurae, scutellum and first abdominal segment shining black. The remaining segments of abdomen shining chestnut brown on basal half, merging into shining black posteriorly; on the fourth segment, the brown reaches forward into the black in the form of three rounded lobes, a median lobe and one in each lateral anterior corner. Hypopygium and fifth sternite shining black. Genitalia not prominent, of simple design, without spinules or spiculate hairs and with simple margin.

All the legs pale yellow, the hind femora dark brown on the apical half and all the tibiae and tarsi slightly brownish, the hind pair almost black. Hind metatarsus considerably enlarged, clothed with pale hairs. Wings with a yellowish tinge.

Length, 6 mm.

Type.—Male; Hull, Quebec. May 26, 1923. (C. H. Curran). [Canadian National collection].

Sphegina notata new species (Pl. XV, fig. 4)

This species is not unlike *S. occidentalis* Malloch superficially, but it is smaller, the abdomen not so slender and the fifth sternite is straight. The latter characteristic together with the short broad form, round shape and color makes the female resemble *infuscata* Loew closely, from which it is distinguished by the bicolored hind femora, short pilose vertex.

Male: Head and face shining black, the latter pale brownish just above the oral margin in front; the vertex and upper front, except for a narrow, bare, median stripe with dark-colored pubescence, the lower front and face especially about the oral margin to projection in front in less than the length of antennae. Cheeks and occiput visible below margin of eyes. Antennae light brown to yellow; arista thickened sharply at base, pubescent apically.

Thorax including scutellum shining black, the pile of dorsum white, short and appressed with three faint quite narrow vittae anteriorly. Scutellum apically with two bristles somewhat longer than the other hairs.

Abdomen shining black, the middle of the second segment and the fourth segment anteriorly, obscurely reddish. The third segment in the middle with a light brownish yellow band. Hypopygium shining black. The hind margin of the fifth sternite either quite straight and even or with a minute notch partially replaced with opaque membrane; no spinules or spicules present. Abdomen short, but little narrowed basally.

Legs pale brownish yellow, the basal half of the hind femora and all of the hind tibiae save a dark spot apically are light reddish; there is a very small but unmistakable sharp black point under the inner side of the hind tibiae; the last two joints of the anterior four tarsi and all of the posterior tarsi black. Hind metatarsus very much enlarged. Wings tinged with brownish. Halteres light brownish or yellowish.

Female: Differing from the male chiefly in the broad, subglobose and rotund abdomen. First segment but little narrowed. Abdominal segments brownish red to light reddish yellow with or without narrow obscure margins laterally and posteriorly.

Length, 8 mm.

Type.—Male; Mt. Rainier, Washington. July, 1926. (Frank M. Hull). [Collection of the author].

Allotype.—Female; data as of type.

Paratypes.—2 ♂, 2 ♀; data as of type. One male and one female paratype presented to the Academy of Natural Sciences of Philadelphia.

By way of summary it might be stated that approximately forty-two valid species of *Sphegina* have been described from the world. Of these nineteen are from North America, twelve are European and ten are Asiatic. One species has been described from South America, but questioned by its author, who was Fabricius. I refer to *Sphegina chiragra?* Fabricius. Dr. Williston suggests affinities for this species with *Merodon* or

Neascia (*Ascia*) in his catalogue listing of South American species. I am inclined to consider it very doubtfully a true *Sphegina*. No specimens are known from Africa, Australia or Oceania, and the genus seems to be without question absent from these regions. For the guidance of future students, I list as briefly as possible the species with which I am acquainted, which are described from each of the three great world regions. Thus, from North America, in addition to those treated here, there are two species. *S. biannulata* Malloch, and *S. monticola* Malloch, known only from the female. Since I have not seen the types of Cole's species *vittata, melanderi, bridwelli,* and *nigrimana,* I prefer to indicate their probable location in the key I have given, and this is done below. Eighteen species are keyed in this paper including the forms now described.

Key to males of Sphegina

1. Front and vertex with considerable long hair, its length over half the breadth of third antennal joint or longer; abdomen only slightly constricted. 2
   Practically no pile distinguishable on front and vertex; if at all present, not more than half in length the breadth of third antennal joint. 5
2. The lower occiput scarcely or not at all visible below the eyes in profile. 3
   Occiput and lower face descending well below margin of eyes in profile. 4
3. Entirely black species; face projecting forward from eye margins the length of antennae or more; vertex quite shaggy. .....*pluto* n. sp.
   Legs and abdomen lighter colored; vertex lightly pilose; face not projecting forward from eye margins for the length of antennae. *brachygaster* n. sp.
4. Basal half of hind femora and basal half of abdominal segments pale colored, otherwise black. .....*perplexa* n. sp.
   Hind femora and abdominal segments more or less uniformly colored; the basal abdominal segments (first two) dark, the apical segments frequently light reddish. .....*infuscata* Lw.
5. Posterior half of last sternite with numerous very long bristly hairs of which there is an especially conspicuous tuft present in the left (from below) posterior corner, or with a conspicuous bunch of close, short, very stubby bristles. 6
   Not such flies. 9

6. Fifth sternite laevo-lobate (from above) 7
   Without semblance of lobate projections. 8
7. Tip of hypopygium short pilose; the lobe is an actual production from the margin of fifth sternite. .....*punctata* Cole
   Tip of hypopygium long pilose; the lobe appears to come from beneath left marginal flap of sternite. .....*petiolata* Coq.
8. Fifth sternite with long stiff marginal hairs, especially in the left posterior corner (from below). .....*rufiventris* Lw.
   Fifth sternite on either side of posterior margin with a cluster of short stiff spinous bristles. .....*companulata* Robts.
9. Without a spinulose fifth sternite. 12
   With a prominent spinulose patch spot on fifth sternite. 10
10. Fifth sternite laevo-lobate. 11
    Margin of fifth sternite normal. .....*keeniana* Will.
11. Lobe slender, rounded, pallid. .....*lobata* Lw.
    Lobe blunt, angular, darkened. .....*occidentalis* Mall.
12. Fifth sternal posterior margin quite even except for slight irregularities, indentations, or very blunt angular projections. 14
    Posterior margin strongly produced in left corner into a conspicuous lobe when viewed from below, dextro-lobate. 13
13. Lobe yellow; species yellow and black. .....*punctata* Cole
    Lobe black; species black and yellow. .....*lobulifera* Mall.
14. A nodular prominence on extreme posterior surface of hypopygium. *flavimana* Mall.
    Without such prominence. 15
15. The hind tibiae on the inside ending apically in a sharp point. 16
    Not such species; hind tibiae ending truncate or rounded. 19
16. Hind femora entirely rufous. .....*armatipes* var. *rufa* Mall.
    The apical half or more of the hind femora dark. 17
17. Species of small size; from four and a half to five and a half mm. The hind femora black on about the apical half. 18
    Larger species: six and one-half to nine mm. Hind tibiae black both apically and basally, with a central yellow band; hind femora dark except narrowly yellow at the base. .....*armatipes* Mall.
18. The hind tibiae blackish only apically. The hind femora as thick as first (second) tergite; western species. .....*notata* n. sp.
    The hind tibiae darkened both basally and apically. The hind femora not as thick as first (second) tergite; eastern species. *flavomaculata* Mall.
19. Margin of last sternite angulate from the right side considered ventrally. Facial knob or prominence rounded and blunt, but strongly produced. 20
    Margins of last sternite evenly truncate, though with a circular indentation to the left. Facial prominence short, angular and truncate. Hind femora pale yellow to red throughout. .....*brachygaster* n. sp.

20. Slender species, apical segments of fore and mid tarsi fuscous. *californica* Mall.

Short-bodied species but with abruptly and greatly swollen hypopygium, the angle of the last sternite not produced....*cressoni* n. sp.

From Europe there have been described by earlier authors: *clunipes* Fall., *loewi* Zell., *kimakowiczi* Strobl., *latifrons* Egger, *spheginea* Zett., *limbipennis* Strobl., *cornifera* Becker, *montana* Becker, *germanica* Becker, *rubripes* Becker, *nigricornis* Macq., and *nigricornis* Zett. According to Becker, *S. zetterstedti* Sch. is *nigricornis* Zett.

From Asia there have been described by earlier authors; *apicalis, nigerima* and *varidissima* by Shiraki; *asciaformis, bispinosa, tenuis, tristriata* and *tricoloripes* by Brunetti, besides *javana* by Meijere, and *orientalis* by Kertesz.

Apparently *S. nigrimana* Cole keys out to *californica* Mall. in my key from which it differs in the largely dark hind femora, biannulate hind tibiae. *S. bridwelli* Cole is certainly similar to *S. cressoni* new species, but is lighter in color; in addition the hind tibiae of *S. cressoni* are biannulate, and the hind femora are darker.

S. vittata Cole with the last sternite evenly truncate posteriorly suggests *brachygaster* new species, but is stated to have a rounded and produced hind tibiae. Moreover, in *brachygaster* the marginal indentation of the last sternite is not replaced with membrane.

S. melanderi Cole is related to *notata* new species in size but apparently lacks the spur upon the tibiae, the last sternite is more or less deeply excavated.

Explanation of Plate XV

Fig. 1.—Hypopygium and fifth sternite of *Sphegina campanulata* Robts.

Fig. 2.—Lateral view of hypopygium of *S. lobulifera* Mall. from type.

Fig. 3.—Lateral view of hypopygium of *S. flavimana* Mall.

Fig. 4.—Fifth sternite and hypopygium of *S. notata* n. sp.

Fig. 5.—Hypopygium of *S. flavomaculata* Mall. from type.

Fig. 6.—Fifth sternite and hypopygium of *S. punctata* Cole.

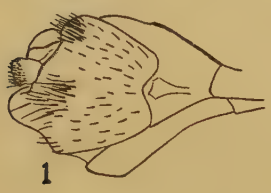
Fig. 7.—Ventral view of hypopygium of *S. californica* Mall. from type.

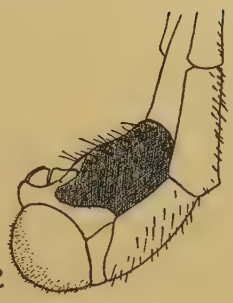
Fig. 8.—View of hypopygium of *S. occidentalis* Mall.

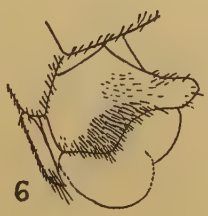
Fig. 9.—Ventral view of fifth sternite and hypopygium of *S. cressoni* n. sp.

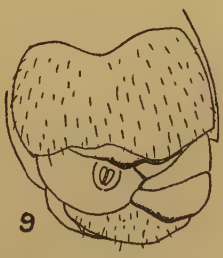
Fig. 10.—Fifth sternite of *S. keeniana* Will.

Fig. 11.—Fifth sternite of *S. lobata* Loew.









F.M.H.
Del.

HULL—NORTH AMERICAN SPHEGINA

DESCRIPTIONS AND RECORDS OF NEARCTIC MUTILLID WASPS OF THE GENERA MYRMILLOIDES AND PSEUDOMETHOCA[1]

(Hymenoptera: Mutillidae)

BY CLARENCE E. MICKEL

University of Minnesota

The following records, notes and descriptions of new species have been added to our knowledge of the Mutillid genera *Myrmilloides* André and *Pseudomethoca* Ashmead since my paper on these genera in 1924.[2] A revised key to the genus *Pseudomethoca* is also included.

Material has been studied belonging to the following institutions and individuals: The American Entomological Society, [A. E. S.]; Mr. C. N. Ainslie, Sioux City, Iowa, [C. N. A.]; Dr. E. G. Anderson, Pasadena, California, [E. G. A.]; Boston Society of Natural History, Boston, Massachusetts, [B. S. N. H.]; Carnegie Museum, Pittsburg, Pennsylvania, [C. M.]; Clemson College, Clemson College, South Carolina, [C. C.]; Connecticut Agricultural Experiment Station, New Haven, Connecticut, [C. A. E. S.]; University of Colorado, Boulder, Colorado, [U. Co.]; Cornell University, Ithaca, New York, [C. U.]; Mr. Richard Dow, Boston, Massachusetts, [R. D.]; Deutsches Entomologisches Institut, Berlin-Dahlem, Germany, [D. E. I.]; Muséum d'Histoire Naturale de Genève, Geneva, Switzerland, [G. N. H. M.]; Dr. Walther Horn, Berlin-Dahlem, Germany, [W. H.]; Mr. W. W. Jones, Douglas, Arizona, [W. W. J.]; University of Kansas, Lawrence, Kansas, [U. K.]; Kansas State Agricultural College, Manhattan, Kansas, [K. A. C.]; Illinois Natural History Survey, Urbana, Illinois, [I. N. H. S.]; University of Michigan, Ann

[1] Paper No. 1303 of the Scientific Journal Series of the Minnesota Agricultural Experiment Station.

[2] Proc. U. S. Nat. Mus., LXIV, art. 15, pp. 1-51, pls. 1-4.

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Myrmilloides grandiceps (Blake)

A female specimen in the collection of the Illinois Natural History Survey, collected at New Orleans, Louisiana, April 23, 1885, slightly extends the range of this species.

Distribution: Iowa, Nebraska, Colorado, Kansas, Oklahoma, Texas and Louisiana.

PSEUDOMETHOCA Ashmead

Key to the species of Pseudomethoca

Females

1. Head spinose or dentate beneath 2
   Head not spinose nor dentate beneath 9
2. Size large, 13 mm.; ventral, postero-lateral angles of head sharply angulate or dentate .....*cephalargia* Mickel
   Size small, 3 to 5 mm.; ventral, postero-lateral angles carinate but not sharply angulate, nor dentate 3
3. Genal carina elevated anteriorly to form a small tooth or spine; gular margin dentate or not 4
   Genal carina not elevated anteriorly to form a spine or tooth; only the gular margin with a small tooth anteriorly .....*dentigula* n. sp.

4. Front produced at the base of the antennae into a thin, bidentate lamella .....*dentifrontalis* Bradley
   Front not so produced 5
5. Posterior margin of genae prominently bidentate anteriorly *nephele* (Fox)
   Posterior margin of genae with only a single, distinct tooth 6
6. Thorax slightly longer than broad, the dorsum almost abruptly rounded into the posterior face of propodeum, the latter subperpendicular ..7
   Thorax as broad as long, the dorsum broadly and gradually rounded into the posterior face of propodeum, the latter oblique 8
7. Pronotum and mesonotum throughout with small, close, mostly distinct but partly confluent punctures; head clothed with sparse, inconspicuous, pale pubescence, as well as sparse, erect, dark hairs *frigida* (Smith)
   Pronotum with small, dense, confluent punctures, becoming larger and denser on the mesonotum and merging into reticulate on the dorsum of propodeum; head clothed with sparse, recumbent, conspicuous, pale pubescence, as well as erect, pale hairs .....*klotsi* n. sp.
8. Carina of postero-lateral angles prominent, sharp, extending upon the vertex; genae with sparse, small punctures; genal tooth, long, spiniform .....*toumeyi* (Fox)
   Carina of postero-lateral angles not prominent, not extending upon the vertex; genae with small, close punctures; genal tooth short, dentiform .....*bequaerti* Mickel
9. Greater part of abdomen ferruginous, or yellowish 10
   Abdomen black, except first and last segments *Wickhami* (Ckll. and Casad)
10. Dorsum of propodeum with a large, prominent, rugose tubercle at the apex medially .....*donae-anae* (Ckll. and Fox)
    Propodeum without any such tubercle 11
11. Dorsum of body densely clothed with erect and semierect pubescence 12
    Dorsum of body thinly clothed with pubescence 15
12. Head distinctly wider than the thorax; pubescence of dorsum of body fulvous .....*harpalyce* (Fox)
    Width of head and thorax about equal 13
13. Pubescence of dorsum of head, thorax and abdomen concolorous ...14
    Pubescence of head and thorax black, that of the second dorsal tergite golden .....*pigmentata* Mickel
14. Pubescence of dorsum of head, thorax and abdomen light golden *aureovestita* Bradley
    Pubescence of dorsum of head, thorax and second tergite fiery red; third tergite with black pubescence medially, silvery pubescence laterally; remaining tergites with silvery pubescence *flammigera* Mickel

15. Head thickly clothed with appressed, silvery or golden pubescence ..16
Head more or less bare, not clothed with appressed, silvery or golden pubescence 21
16. Size small, 3 to 5 mm. 17
Size large, 7 to 10 mm. 18
17. Second abdominal tergite reticulato-punctate medially on the basal half .....*oculissima* Mickel
Second abdominal tergite finely punctate throughout *scaevolella* (Ckll. and Casad).
18. Second abdominal tergite with a well defined pattern of silvery maculation 19
Second abdominal tergite without any well defined pattern of silvery maculation .....*praeclara* (Blake)
19. Second abdominal tergite with a large, basal and apical, dark macula connected by a narrow line, thereby making the form of an hour-glass; the remainder of the segment filled in with silvery pubescence; punctures of the thorax coarse but rather close, not running into reticulations posteriorly .....*connectens* (Cresson)
Second abdominal tergite with a transverse bar of thin, silvery pubescence a little behind the middle, which is extended near each side into a narrower stripe almost to the base of the segment, thus ⊥⊥; thorax with distinct reticulations posteriorly 20
20. Distance between posterior margin of eyes and postero-lateral angles one and one-half times the greatest diameter of the eyes *contumeliosa* n. sp.
Distance between posterior margin of eyes and postero-lateral angles about equal to the greatest diameter of the eyes *contumax* (Cresson)
21. Size small, 3 to 5 mm., pygidium punctate 22
Size large, 8 to 15 mm., pygidium rugose or striate 23
22. Body testaceous, second abdominal tergite without any definite pattern of silvery ornamentation .....*aprica* (Melander)
Body ferruginous, second abdominal tergite with two, round, silvery spots of pubescence .....*nudula* Mickel
23. Pygidium rugose 24
Pygidium striate 29
24. Head, thorax, and abdomen for the most part ferruginous 25
Head and thorax black; second abdominal tergite entirely, and remaining abdominal tergites fringed at the apex, with golden pubescence *brazoria* (Blake)
25. Humeral angles of prothorax with a weak, slightly elevated carina ..26
Humeral angles of prothorax with a strong, sharp carina 27

26. Propodeum with the posterior face more or less rounded into the dorsum, not at a distinct right angle with the dorsum; metapleurae micropunctate, thinly clothed with silvery pile ....*sanbornii* (Blake)
Propodeum with the posterior face at a distinct right angle with the dorsum; metapleura sometimes very slightly micropunctate, not clothed with silvery pile .....*propinqua* (Cresson)
27. Humeral angles acute .....*oceola* (Blake)
Humeral angles more or less rounded 28
28. Apex of second abdominal tergite broadly fringed with black; legs reddish .....*meritoria* Mickel
Apex of second abdominal tergite silvery pubescent, with a narrow fringe of black pubescence medially; legs blackish red *paludata* Mickel
29. Lateral margins of propodeum distinctly dentate ....*simillima* (Smith)
Lateral margins of propodeum not dentate 30
30. Second abdominal segment with a pair of pale spots on the apical half .....*oculata* (Banks)
Second abdominal tergite uniform in color throughout ....*aeetis* (Fox)

Males

1. Size small, 3 to 5 mm. 2
Size large, 7 to 20 mm. 4
2. Postero-lateral angles of head dentate .....*frigida* (Smith)
Postero-lateral angles of head rounded or obtuse 3
3. Head quadrate, the punctures sparse, coarse, evenly distributed *gila* (Blake)
Head transverse, the punctures fine, sparse and irregularly distributed *athamas* (Fox)
4. Pubescence of abdomen above, fiery red or golden 5
Pubescence of abdomen above, white or black 10
5. Each abdominal tergite with an apical band of fiery red pubescence *vanduzei* Bradley
Abdominal tergites 3 to 5, at least, with an apical band of golden pubescence 6
6. Abdomen castaneous, second tergite yellowish; tegulae coarsely punctate throughout; second abdominal tergite with fine, sparse punctures .....*flavida* (Blake)
Abdomen entirely black 7
7. Integument of dorsum of thorax yellowish .....*propinqua* (Cresson)
Integument of dorsum of thorax black 8
8. Head and thorax clothed above with golden pubescence *aureovestita* Bradley
Head and thorax clothed entirely with black pubescence 9

9. Head quadrate, as broad as the thorax; calcaria pale ..... *pigmentata* Mickel
   Head not quadrate, rounded, narrower than the thorax; calcaria black ..... *brazoria* (Blake)
10. Second abdominal tergite red 11
    Body entirely black 15
11. Posterior part of tegulae bent downward so as to form a posterior face at a sharp angle with the dorsal surface 12
    Tegulae convex, without a posterior face 14
12. Femora densely clothed beneath with long hairs ..... *oceola* (Blake)
    Femora sparsely pubescent beneath 13
13. Tegulae rugosely punctate throughout; sixth and seventh tergites with whitish pubescence ..... *paludata* Mickel
    Tegulae sparsely punctate, shining; all the tergites with black pubescence ..... *simillima* (Smith)
14. Body clothed with pale pubescence ..... *russeola* Mickel
    Body clothed with black pubescence ..... *sanbornii* (Blake)
15. Body clothed with pale pubescence 17
    Body clothed with black pubescence 16
16. Sides of propodeum rugoso-striate ..... *nigricula* Mickel
    Sides of propodeum rugoso-punctate ..... *anthracina* (Fox)
17. Abdominal tergites with a distinct apical band of pale pubescence ..18
    Abdominal tergites without a distinct apical band of pale pubescence ..... *geryon* (Fox)
18. Tegulae subhemispherical, with a distinct posterior face; wings subfuscous ..... *carbonaria* Mickel
    Tegulae convex, without a distinct posterior face 19
19. Frontal tubercles at insertion of antennae densely punctate ..... *aegaeon* (Fox)
    Frontal tubercles at insertion of antennae smooth and shining 20
20. Second tergite with strong, close punctures, especially at the base and apex ..... *albicoma* Mickel
    Second tergite with sparse punctures throughout ..... *manca* Mickel

Pseudomethoca frigida (Smith) New combination

1855. *Mutilla frigida* Smith, Cat. Hymen. Brit. Mus., III, p. 60. (♀.)
1871. *Mutilla* (*Sphaerophthalma*) *canadensis* Blake, Trans. Amer. Ent. Soc., III, p. 252. (♀.) (New synonymy.)
1871. *Mutilla frigida* Blake, Trans. Amer. Ent. Soc., III, p. 256. (♀.)
1886. *Sphaerophthalma frigida* Blake, Trans. Amer. Ent. Soc., XIII, p. 239. (♀.)
1897. *Mutilla frigida* Dalle Torre, Cat. Hymen., VIII, p. 42. (♀)

1899. *Mutilla frigida* Fox, Trans. Amer. Ent. Soc., xxv, p. 273. (♀.)
1903. [Genus?] *frigida* André, Gen. Ins., i, fasc. 11, p. 73. (♀.)
1924. *Pseudomethoca canadensis* Mickel, Proc. U. S. Nat. Mus., lxiv, art. 15, p. 9, pl. 2, fig. 7. (♀, ♂.)

I have examined Smith's type of *frigida* and compared it with specimens of *canadensis* Blake. The two are indistinguishable and are without doubt the same species. It is unfortunate that Smith's *frigida* should have remained unrecognized so long, as it is one of the more common species of *Pseudomethoca* in North America and has a wide distribution. Since the name *frigida* has priority it must replace *canadensis*, the name by which the species has been known heretofore.

Type.—Female; Great Bear Lake, Canada. [British Museum of Natural History, London].

For additional information regarding types and synonymy, cf. Mickel (1924).

This species is likely to be found anywhere east of the Rocky Mountains in Canada and the United States. Male specimens are comparatively rare. I have studied specimens from Canada, Nova Scotia, Massachusetts, Connecticut, New York, Pennsylvania, Ohio, Michigan, Indiana, Illinois, Minnesota, Montana, South Dakota, Colorado, Texas, Oklahoma, Kansas, Nebraska, Iowa, New Jersey, Maryland, District of Columbia, Virginia, North Carolina, Georgia, Alabama and Louisiana. [C. N. A.; E. G. A.; C. A. E. S.; C. U.; R. D.; G. N. H. M.; W. H.; U. K.; K. A. C.; I. N. H. S.; U. M.; O. S. U.; Ok. C.; S. D. A. C.; and W. C. S.]

Pseudomethoca klotsi new species

Closely related to *frigida* Smith, but differs in the more prominently elevated antennal tubercles, denser punctuation of the pronotum and mesonotum, weakly dentate humeral angles, and the pubescent pattern of the second tergite.

Female: Entirely ferruginous, clothed with sparse, pale pubescence, that on the head moderately conspicuous, except the second abdominal segment in part with sparse, black pubescence; head quadrate, distinctly wider than the thorax; posterior margin of genae defined by a distinct carina extending three-fifths of the distance from the postero-lateral angles to the mandibles and terminating anteriorly in a distinct tooth; thorax slightly longer

than wide, the dorsum abruptly rounded into the posterior face of propodeum, the latter subperpendicular; pronotum and anterior portion of mesonotum with moderately small, dense, confluent punctures; pygidial area distinct, granulate. Length, 6 mm.

Head quadrate, entirely ferruginous, clothed throughout with sparse, recumbent, and scattered, erect, pale pubescence, the latter more conspicuous than on the thorax and abdomen; mandibles slender, acute at the apex and with a single tooth within near the apex; clypeus medially with a distinct, arcuate, elevated carina; antennal tubercles elevated, separated, the distance between them equal to the length of the first segment of flagellum; scape finely punctate and with sparse, pale pubescence; first segment of flagellum slightly shorter than the second and third segments united; antennal scrobes distinctly carinate above; front, vertex and genae with small, dense, slightly confluent punctures throughout; posterior margin of genae as described above; head well developed behind the eyes, the distance between the margins of the eyes and postero-lateral angles slightly greater than the greatest diameter of the eyes; relative widths of head and thorax, 2.9: 2.3.

Thorax slightly longer than broad, the posterior face of propodeum subperpendicular to the dorsum and abruptly rounded into it, clothed throughout with sparse, pale pubescence, except the pronotum and mesonotum with sparse, short, dark fuscous, inconspicuous pubescence, and the pleural areas mostly bare; pronotum and mesonotum with small, dense, deep, confluent punctures, the latter becoming larger on the mesonotum posteriorly and merging into the reticulation of the dorsum and posterior face of propodeum; dorsum of thorax strongly, transversely convex; humeral angles distinct, acutely but weakly dentate; thorax widest just behind the anterior spiracles, distinctly constricted at the posterior spiracles; lateral margins of posterior face of propodeum serrate; anterior margin of propleurae defined by a distinct carina; propleurae with small, close punctures and sparse, pale pubescence; anterior half of mesopleurae finely, closely punctate; remainder of mesopleurae, metapleurae and sides of propodeum, bare, glabrous, impunctate.

Abdomen entirely ferruginous; first tergite with small, dense punctures at the apical margin, clothed with sparse, long, erect, pale hairs, and a sparse, apical fringe of pale pubescence; second tergite with small, close somewhat confluent punctures throughout, the latter slightly deeper and more confluent anteriorly, clothed with sparse, recumbent and erect, black pubescence, except the lateral margins and a broad, sinuate, median, transverse band distinctly interrupted medially of sparse, recumbent and erect, pale pubescence, the band confluent at the sides with the pale pubescence of the laterial margins; apical fringe of second tergite entirely black; tergites three to five with very small, weak, separated punctures, clothed with sparse, pale pubescence; pygidial area distinct, weakly margined laterally, granulate; first sternite with a median, longitudinal

carina; second sternite with small, distinct, separated punctures and sparse, pale pubescence; posterior margins of sternites three to five with very small, close punctures, each with a thin, apical fringe of pale pubescence.

Legs entirely ferruginous, sparsely clothed with pale pubescence; calcaria pale.

Holotype.—Female; Hugo, Colorado. July 2, 1932. (A. B. Klots). [University of Minnesota collection].

Pseudomethoca dentifrontalis Bradley

A specimen of this species was collected at Corvallis, Oregon, April 26, 1930, (H. A. Scullen), [Or. A. C.]. It was known previously only from California.

Pseudomethoca athamas (Fox)

Previously known only from California. An additional record is: Corvallis, Oregon, August 30, 1925, (H. A. Scullen), 1 ♂, [Or. A. C.].

Pseudomethoca gila (Blake)

A second record of this species is as follows: Brownsville, Texas, November 23, 1911, 1 ♂, [I. N. H. S.].

Pseudomethoca toumeyi (Fox)

A specimen in the collection of the University of Kansas apparently belongs here and is the first record other than the type: female, Kendall county, Texas, July 22, 1929, (L. D. Beamer).

Pseudomethoca dentigula new species

Somewhat similar in appearance to *frigida* but lacks the genal tooth on the head, has a distinct gular tooth, and the pygidium distinct and granulate. The head is quadrate and large with a sharp, genal carina as in the species with a genal tooth.

Female: Entirely ferruginous, sparsely pubescent, the pubescence on the front and vertex, black, that on the dorsum of the thorax pale, and that on the abdomen pale, except the second tergite with a broad, anterior band, and a narrow, apical band, black; gular margin of head with a small, distinct tooth anteriorly; humeral angles angulate, but not conspicuously so; pygidial area distinct, granulate. Length, 5 mm.

Head ferruginous, clothed with sparse, pale, glittering pubescence, except the front and vertex with sparse, black pubescence; mandibles slender, edentate at the apex and with a small tooth within near the apex, the

apices blackish; clypeus only slightly elevated posteriorly to form an arcuate, transverse carina terminating at the anterior margin each side in a small tooth; antennal tubercles glabrous, distinctly separated; scape with small, close punctures above and sparse, pale pubescence; first segment of flagellum one and one-half times as long as the second; antennal scrobes distinctly carinate above; front, vertex and genae with small, distinct, close punctures; posterior margin of genae defined anteriorly by a sharp, distinct carina, the latter terminating anteriorly slightly posterior to the gular margin; genal carina not elevated into a tooth; gular margin elevated anteriorly into a small tooth; distance between posterior margin of eyes and postero-lateral angles of head equal to greatest diameter of the eyes; relative widths of head and thorax, 2.5 : 2.1.

Thorax entirely ferruginous, sparsely clothed with pale, glittering pubescence, that on the dorsum recumbent, on the propodeum, erect; thorax widest at anterior spiracles, narrowest at propodeal spiracles; relative widths at humeri, anterior spiracles, propodeal spiracles and propodeum, 1.95 : 2.1 : 1.6 : 1.8; dorsum of thorax with moderately small, dense, confluent punctures, becoming reticulate posteriorly and merging with reticulation of propodeum; dorsum and anterior half of posterior face of propodeum reticulate, the posterior half with scattered, fine punctures; lateral margins of dorsum with a pair of small teeth at the humeri, immediately in front of anterior spiracles, at the mid-point of lateral margins of mesonotum, and the anterior margin of the propodeal spiracles elevated to form a pair of blunt teeth; lateral margins of dorsum of propodeum finely denticulate; anterior margin of propleurae defined by a distinct carina; propleurae with small, indistinct punctures; mesopleurae finely, delicately reticulate; metapleurae and sides of propodeum bare, glabrous, impunctate.

Abdomen ferruginous, clothed throughout with sparse, pale glittering pubescence, except a broad band at the anterior margin not extending onto the lateral fourths, and a narrow band at the posterior margin, of sparse, black pubescence; first tergite with moderately small punctures becoming dense posteriorly; median, longitudinal half of second tergite with small, very dense, deep, confluent punctures, the lateral fourths with small, separated punctures; tergites three to five with small, shallow, close punctures; pygidial area distinct, granulate; first sternite with a distinct, median, longitudinal carina; second sternite with moderately small, separated punctures.

Legs ferruginous sparsely clothed with pale, glittering pubescence; calcaria pale.

Holotype.—Female; Trans-Pecos, Texas. (Wheeler). [Muséum Nationale d'Histoire Naturelle, Paris].

Paratype.—Female; Trans-Pecos, Texas, (Wheeler), [U. M.].

Pseudomethoca scaevolella (Cockerell and Casad)

Two specimens are at hand: Presidio, Texas, May 4, 1930, (E. R. Tinkham), 1 ♀, [E. R. T.]. Valerde, New Mexico, July 12, 1932, (M. J. Oosthuizen), 1 ♀, [U. M.].

Pseudomethoca aprica (Melander)

The known range of this species is somewhat extended by the following record: Payne county, Oklahoma, July 5, 1925, (W. J. Brown), 1 ♀, [U. M.].

Pseudomethoca donae-anae (Cockerell and Fox)

The following specimens add to the knowledge of the distribution of this species: Presidio, Texas, May 20, 1929, (E. R. Tinkham), 1 ♀, [E. R. T.]. Mesilla Park, New Mexico, August 18, (Ckll.), 1 ♀, [U. M.]. Douglas, Arizona, (W. W. Jones), 2 ♀, [U. M.; W. W. J.]. Douglas, Arizona, August 21, 1933, (W. W. Jones), 1 ♀, [W. W. J.]. Sacaton, Arizona, July 25, 1924, (J. A. Harris, Jr.), 1 ♀, [U. M.]. Sacaton, Arizona, August 7, 1923, (J. A. Harris, Jr.), 1 ♀, [U. M.].

Pseudomethoca contumax (Cresson)

1865. *Mutilla contumax* Cresson, Proc. Ent. Soc. Phila., IV, p. 437. (♀.)
1874. *Mutilla microphthalma* Gerstaecker, Arch. f. Naturg., XL, p. 64. (♀.) (New synonymy.)
1924. *Pseudomethoca contumax* Mickel, Proc. U. S. Nat. Mus., LXIV, art. 15, p. 19. (♀.)

I have examined Gerstaecker's type of *microphthalma* in the Zoologisches Museum der Universität, Berlin, and find it to be identical with Cresson's species. Gerstaecker's type is labeled "no. 6628, Mexico (Koppe)".

Additional records are: Buffalo, South Dakota, September 9, 1917, (H. C. Severin), 1 ♀, [S. D. A. C.]. Presidio, Texas, June 15, 1930, (E. R. Tinkham), 2 ♀, [E. R. T.]. Presidio, Texas, May 28, 1930, (E. R. Tinkham), 1 ♀, [E. R. T.]. Davis Mts., Texas, Fort Davis Quad., Phantom Lake, June 11, 1916, (F. M. Gaige), 1 ♀, [U. M.].

Pseudomethoca contumeliosa new species

Female: Very similar to *contumax* Cresson in color pattern, but body more thickly pubescent and head much larger in relation to thorax than *contumax*. Length, 10 mm.

Head clothed with dense, appressed and erect, pale golden pubescence, obscuring the sculpture, except the posterior margin of the genae defined by a distinct carina terminating at the postero-lateral angles; head much broader than the thorax, relative widths 5.1 : 4.0 (in *contumax,* 4.2 : 3.7); eyes small, the distance between the posterior margin of eyes and the postero-lateral angles one and one-half times the greatest diameter of the eyes (in *contumax,* the same distance about equal to the greatest diameter of the eyes).

Dorsum of thorax clothed with appressed and erect, black pubescence, except the dorsum of propodeum with a pair of lateral spots of pale pubescence; posterior face of propodeum with sparse, erect, pale pubescence.

Abdomen maculated as in *contumax;* pygidial segment clothed with black pubescence; pygidial area rugulose.

Holotype.—Female; Hall's Flat, Lassen National Forest, California. June 19, 1933. (K. A. Salman). [University of Minnesota collection].

Paratypes.—Female; Snowville, Utah, May 1, 1933, (E. W. Anthon), [U. A. C.]. Female; Ridgedale, Idaho, June 3, 1934, (C. F. Smith), [U. M.].

Pseudomethoca praeclara (Blake)

The following records are new; Arizona: Douglas, August 8, 1928, 1 ♀, [W. W. J.]; August 29, 1929, 1 ♀, [U. M.]; August 10, 1931, 1 ♀, [W. W. J.]; August 1, 1933, (W. W. Jones), 1 ♀, [W. W. J.]. Globe, August, (D. K. Duncan), 1 ♀, [U. M.]. Thaxter, April, 1913, (Chamberlin), 1 ♀, [U. M.].

Pseudomethoca anthracina (Fox)

A single specimen has been seen: Male, Bakersfield, California, August 19-20, 1917, [C. U.].

Pseudomethoca harpalyce (Fox)

The following record extends the range of this species: Ashland, Oregon, March, 1916, (K. A. Salman), 1 ♀, [K. A. S.].

Pseudomethoca pigmentata Mickel

1924. *Pseudomethoca pigmentata* Mickel, Proc. U. S. Nat. Mus., LXIV, art. 15, p. 24. (♀.)

A specimen which is undoubtedly the male of this species was collected by Mr. H. B. Parks near the type locality of the female. A female and male were taken at the same time and place and although they were not taken in copulation certain morphological

characters are good evidence for uniting them as the sexes of a single species. The head of the male is large and quadrate like that of the female; the male has a black head and thorax and the abdomen clothed with golden pubescence which is similar to the female; further the calcaria of both female and male are pale while in most other species from this region the calcaria are black. The description of the male is as follows:

Male: Entirely black, clothed with sparse, black pubescence, except a thin fringe at the distal margin of the first tergite, the posterior half of the second tergite sparsely, tergites three to six and the pygidial tergite thickly, thick fringes at the distal margins of tergites two to six, and thin fringes at the distal margins of sternites two to six, all golden; head large, quadrate, about as broad as the thorax; middle and hind femora with sparse, long, pale hairs beneath; calcaria pale. Length, 12 mm.

Head entirely black, sparsely clothed with erect, black pubescence; mandibles tridentate; clypeus transverse, closely punctate; antennal tubercles widely separated; scape closely punctate; first segment of flagellum slightly longer than half the length of the second; antennal scrobes not carinate above; front with moderate, dense, confluent punctures; genae with moderate, close punctures; genae not carinate beneath; postero-lateral angles not carinate; distance from posterior margin of eyes to postero-lateral angles equal to five-sixths the greatest diameter of the eyes; relative widths of head and thorax at the tegulae, 4.5: 4.8.

Thorax entirely black, sparsely clothed throughout with erect, black pubescence; pronotum, mesonotum and scutellum with moderate, dense, confluent punctures; humeral angles rounded; dorsum and posterior face of propodeum moderately reticulate; propleurae defined anteriorly by a weak carina, with moderate, close punctures; mesopleurae with moderate, close punctures throughout; metapleurae glabrous, impunctate; sides of propodeum with large, confluent punctures except the anterior margin glabrous, impunctate. Tegulae truncate posteriorly, black, glabrous, impunctate except the anterior and inner margins with scattered punctures and black pubescence.

Abdomen black, clothed with erect, golden pubescence, as mentioned above, and elsewhere with sparse, erect, black pubescence; first tergite with moderate, distinct punctures; second tergite with moderate, distinct, well separated punctures; tergites three to six with small, close punctures; first sternite moderately, closely punctate; second sternite with moderately large, distinct punctures; sternites three to six with small, close punctures towards the distal margin; hypopygium closely punctate.

Wings fuscous; cell 2nd $R_1 + R_2$ rounded apically; cell R_5 receiving vein M_{3+4} at about the middle; cell R_4 present but less distinct than R_5 and receiving M_2 about one-third the distance from base to apex.

Legs black, clothed with sparse, black pubescence except the middle and hind femora with sparse, long, pale hairs; calcaria pale.

Allotype.—Male; Pecos river, Brewster county, Texas. June 12, 1934. (H. B. Parks). Collected at the same time and place as a female. [University of Minnesota collection].

Superficially this male is very much like the male of *brazoria* Blake but is easily distinguished by the large quadrate head and pale calcaria.

Specimens examined.—Davis Mts., Texas, Fort Davis Quad., Phantom Lake, July 12, 1916, 1♂; same locality, May 23, 1916, (all F. M. Gaige), 1♀, [U. M.]. Chisos Mts., Brewster Co., Texas, July 4, 1930, (H. M. Smith), 1♀, [K. A. C.]. July 24, 1911, (H. A. Wenzel), 1♀, [A. E. S.]. Fort Davis, Texas, July 10, 1911, (H. A. Wenzel), 1♂, [A. E. S.].

Pseudomethoca oceola (Blake)

The following records extend the range of this species to the states of New Jersey and Oklahoma: New Jersey, (Fox), 1♀, [M. N. H. N.]. Mt. Scott, Oklahoma, May 9, 1931, (H. Mathewson), 1♀, [U. Co.].

Pseudomethoca nigricula Mickel

A second specimen of this species has been collected by Mr. Wyatt W. Jones as follows: Male, Douglas, Arizona, August 7, 1933, [U. M.].

Pseudomethoca paludata Mickel

1924. *Pseudomethoca paludata* Mickel, Proc. U. S. Nat. Mus., LXIV, art. 15, p. 29. (♀.)

1924. *Pseudomethoca scrupulosa* Mickel, Proc. U. S. Nat. Mus., LXIV, art. 15, p. 31, pl. 4, fig. 15. (♂.) (New synonymy.)

A series of females and males collected at Halsey, Nebraska in 1924 and 1925 by Dr. R. W. Dawson confirms my suggestion in the original description of *scrupulosa* that the latter is the male of *paludata*. The following material has been examined since 1924:

NEBRASKA: Meadow Grove, June 2, 1930, (C. N. Ainslie), 2♀, [C. N. A.; U. M.]. Halsey, August 12 to 16, 1925, (R. W. Dawson), 16♀, 13♂, [U. M.]; same locality, August 29 to September 3, 1924, (R. W. Dawson), 16♀, 2♂, [U. M.].

COLORADO: No data, 1♂, [A. E. S.]. Drennan, August 17, 1924, 3♀, [U. M.]. Eckley, June 30, 1925, (R. H. Beamer), 2♀, [U. K.; U. M.].

Roggen, June 17 to July 25, 1930, (H. Rodeck), 7♀, [U. Co.; U. M.]. Roggen, July 8, 1933, (M. and H. James), 1♀, [U. M.]. Eads, July 29, 1933, (Rodeck and James), 1♀, [U. M.].

ARIZONA: 30 miles east of Quijotca, Pima County, August 28 to 29, 1927, 1♀, [C. U.]. No definite locality, April, (Igel), 1♀, [N. S.].

Pseudomethoca aeetis (Fox)

A specimen in the Muséum Nationale d'Histoire Naturelle, Paris is labeled "Connecticut". If that locality is correct it extends the range of this species northward considerably. The most northerly record previous to this was Southern Pines, North Carolina.

Pseudomethoca simillima (Smith)

I have examined Smith's type in the British Museum of Natural History and find that the specimens recorded in 1924 agree with the type specimen. I have records of this species from the following states not mentioned in the 1924 list: Massachusetts, New Hampshire, South Carolina, Ohio, Michigan, Illinois and Oklahoma, [D. E. I.; C. C.; I. N. H. S.; U. Ok.; U. M.; R.D.].

Pseudomethoca oculata (Banks)

A number of the specimens recorded by me (1924) as this species are unquestionably *simillima* (Smith). *Oculata* (Banks) may be accurately separated from *simillima* by the characters given in the revised key included herein.

Pseudomethoca geryon (Fox)

The following records are new: Berkeley, Massachusetts, September 1, 1913, 1♂, [B. S. N. H.]. Nantucket, Massachusetts, September 16, 1927, (C. W. Johnson), 1♂, [U. M.]. Weymouth, New Jersey, 1♂, [C. U.]. Dexter, Michigan, September 16, 1924, (E. G. Anderson), 3♂, [U. M.]. Dexter, Michigan, September 19, 1924, (E. G. Anderson), 1♂, [U. M.]. South Carolina (Zimmerman), 1♂, [Z. I. U.].

Pseudomethoca sanbornii (Blake)

I have seen specimens of this species from the following states not included in the 1924 list: Ohio, Indiana, Michigan and Iowa, [C. N. A.; O. S. U.; H. M.; U. M.].

Pseudomethoca propinqua (Cresson)

A specimen (superficially a female) collected at Buffalo, South Dakota, September 3, 1926, (H. C. Severin), [U. M.], has three distinct ocelli, the ocellar area situated in a transverse, broad, black band on the vertex extending from eye to eye, the band angularly produced at the anterior middle to include the anterior ocellus. Since a black head, and the presence of ocelli are male characters, I regard this specimen as a gynandromorph. The remainder of the head, and the thorax and abdomen entirely, are normal for the female.

Pseudomethoca brazoria (Blake)

1924. *Pseudomethoca propinqua* Mickel (in part), Proc. U. S. Nat. Mus., LXIV, art. 15, p. 39, pl. 3, fig. 13. (♂.)

The males of *propinqua* mentioned by me (1924) as having the head and thorax entirely black, I now regard as the male of *brazoria*. Professor H. B. Parks, San Antonio, Texas, has collected both females and males of *brazoria* in Bexar county, Texas. The male is similar in all respects to the male of *propinqua* except the head and thorax including the pubescence are entirely black.

Allotype.—Male; Bexar county, Texas. June 24, 1932. (H. B. Parks), [University of Minnesota collection].

The following additional records are known to me:

TEXAS: Austin, May, 2♀, 1♂, [U.T.; U.M.]. Austin, October 24, 1927, 1♀, [U.T.]. Bexar County, June 12, 1933, (H.B.Parks), 1♀, [H.B.P.]; same data except, July 7, 1933, 3♀, [H.B.P.; U.M.]; same data except, July 13, 1933, 1♀, [H.B.P.]; same data except, August 4, 1933, 1♀, [H. B.P.]; same data except, August 10, 1933, 2♀, [H.B.P.; U.M.]; same data except, August 30, 1933, 47♀, 1♂, [H.B.P.; U.M.]; same data except, October, 1♀, 1♂, [H.B.P.]; same data except, June and July, 2♀, [H.B. P.; U.M.]. Bastrop County, 6♀, [U.T.]. Baird, September, (J. C. Bradley), 1♂, [C.U.]. Somerset, May 10, 1918, (Grace O. Wiley), 1♀, [U.M.] Denton, June 6, 1932, (H. M. Smith), 1♀, [A.E.S.].

OKLAHOMA: Harmon County, May 16, 1931, (Lois Bird), 1♀, [U.Ok.].

Pseudomethoca carbonaria Mickel

A third specimen of this species is in the collection of the Illinois Natural History Survey: Male, Sarita, Texas, December 5, 1911.

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